

Biology or Biology (Human)



SLIDE Masters

FELTHAM PRESS

MICROSCOPY

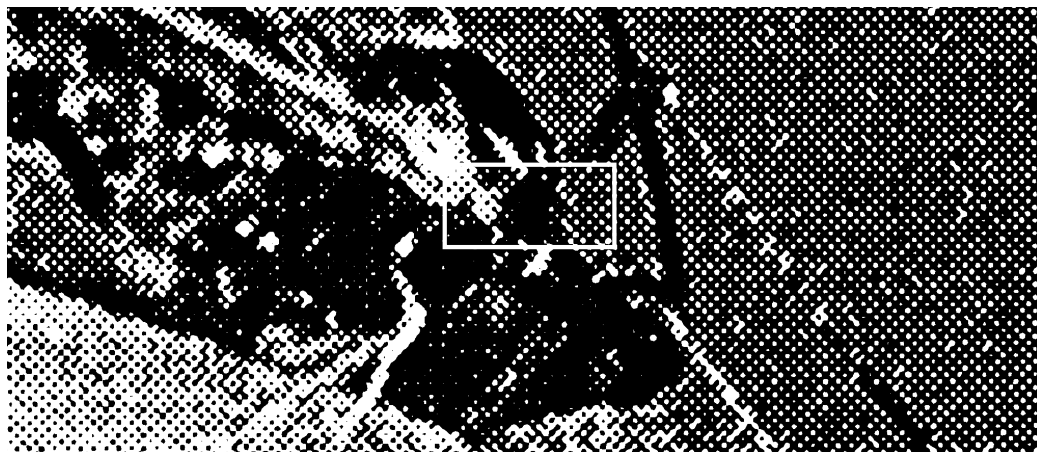
Magnification and Resolution

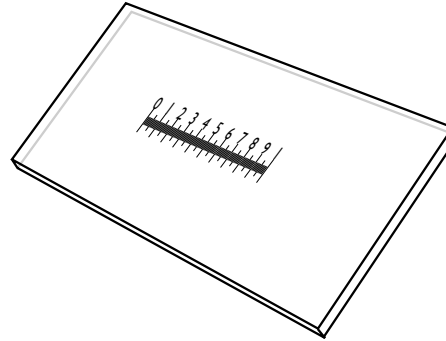
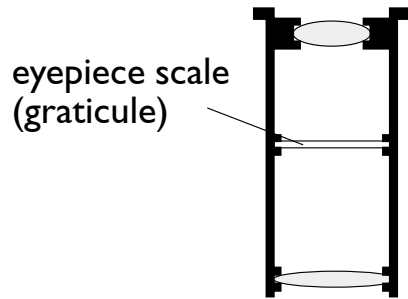
The image is composed of dots.

No amount of **magnification** will reveal any more detail or information ie; nothing more can be **resolved**.

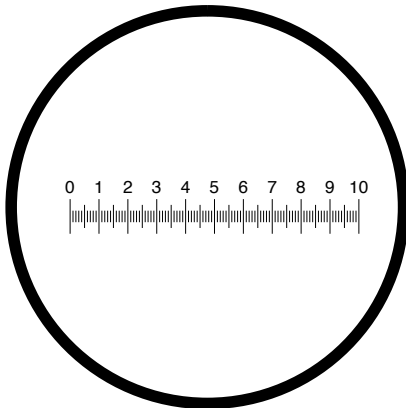
Magnification increases the apparent size of an object.

Resolution is the ability of an optical system to distinguish between adjacent points.

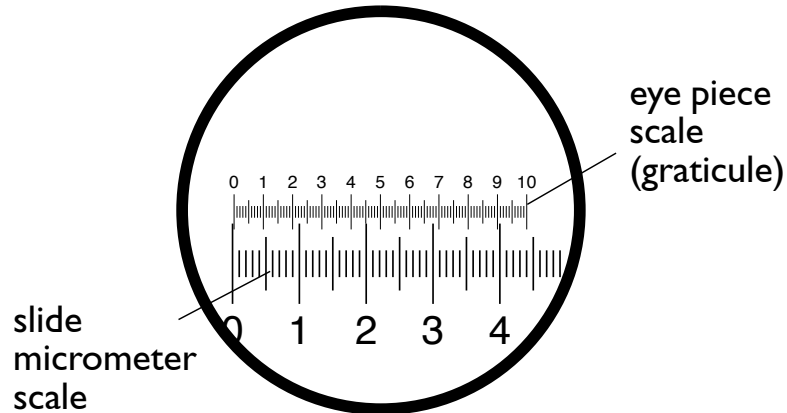




Scale in mm etched upon a microscope slide or a printed acetate sheet (slide micrometer)



Eyepiece scale as seen when held up to the light away from the microscope.

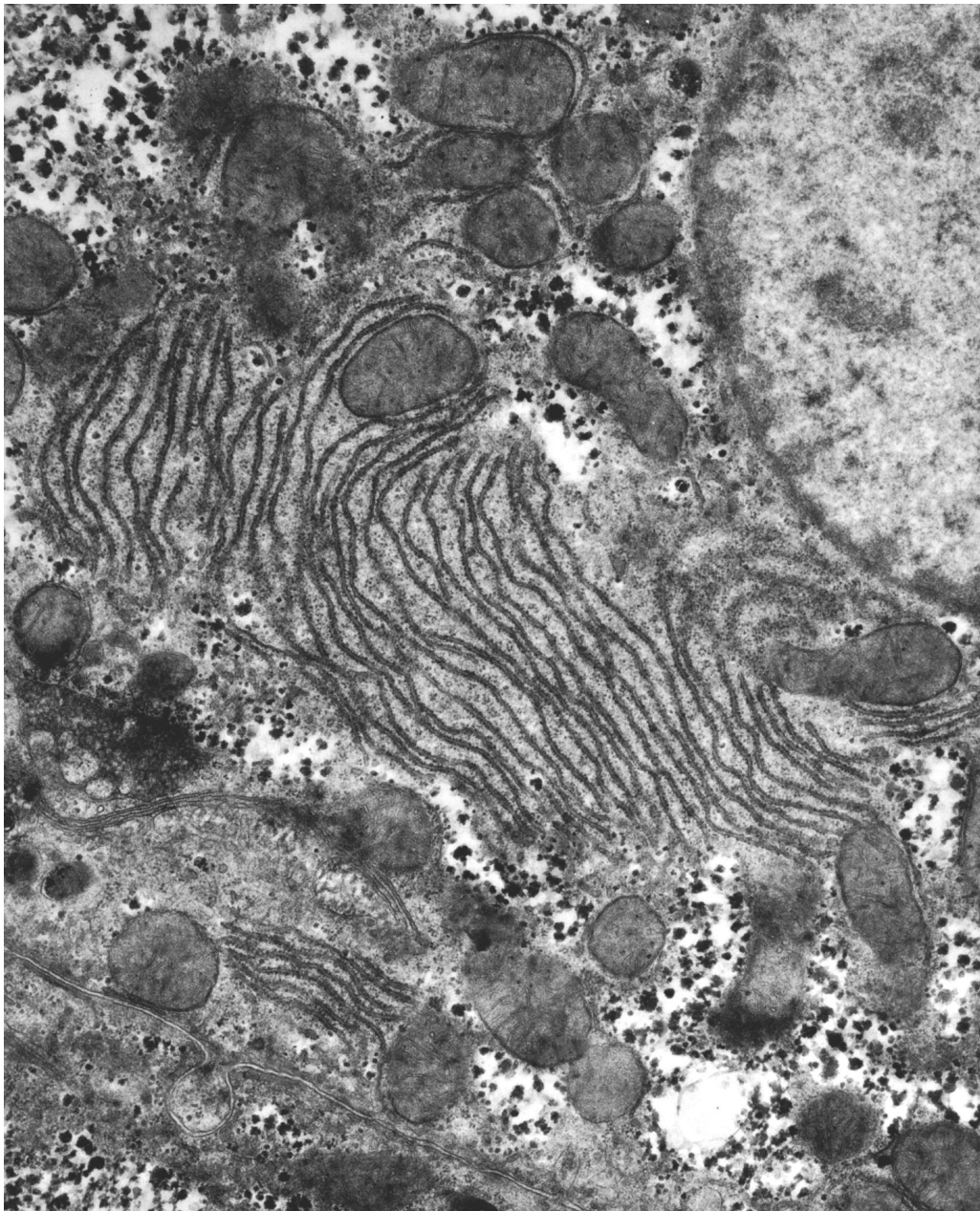


Accurate measurements can be achieved using the two scales in combination through the lenses of the microscope

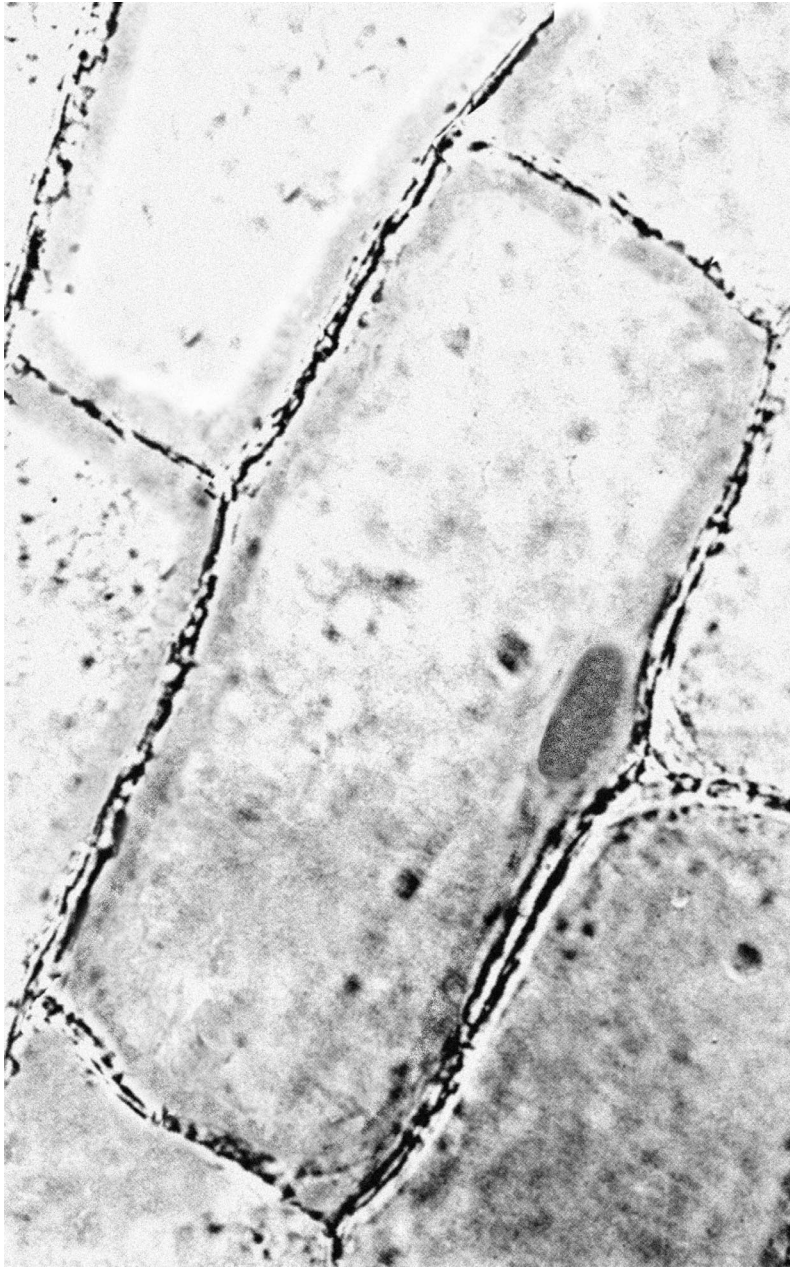
Photomicrograph of human cheek cell



Electron micrograph of human liver cell



Photomicrograph of plant cells



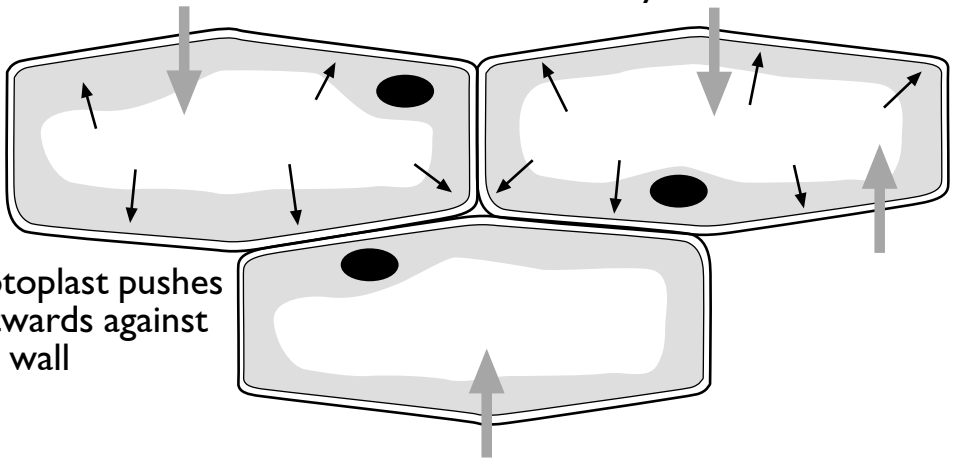
Diagrams of turgid and plasmolysed cells

Turgid Cells

Surrounding solution has lower water potential than protoplast

Water taken in by osmosis

Protoplast pushes outwards against cell wall

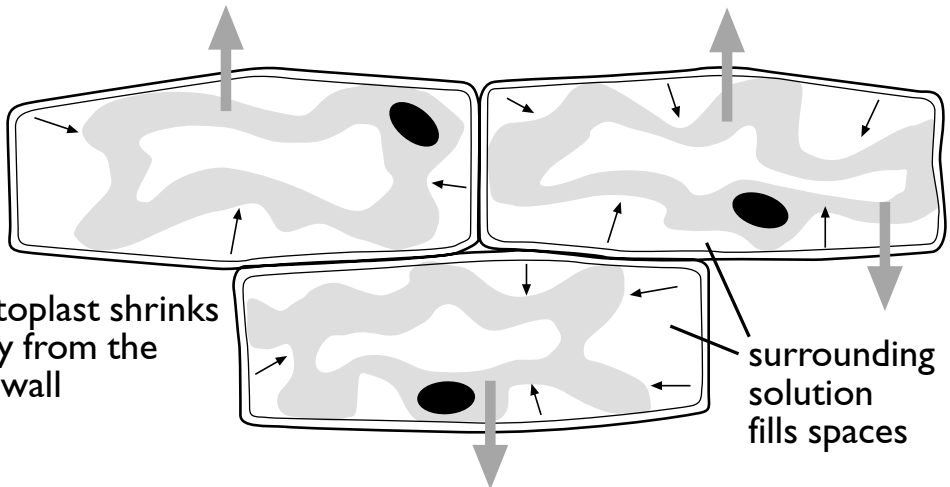


Plasmolysed Cells

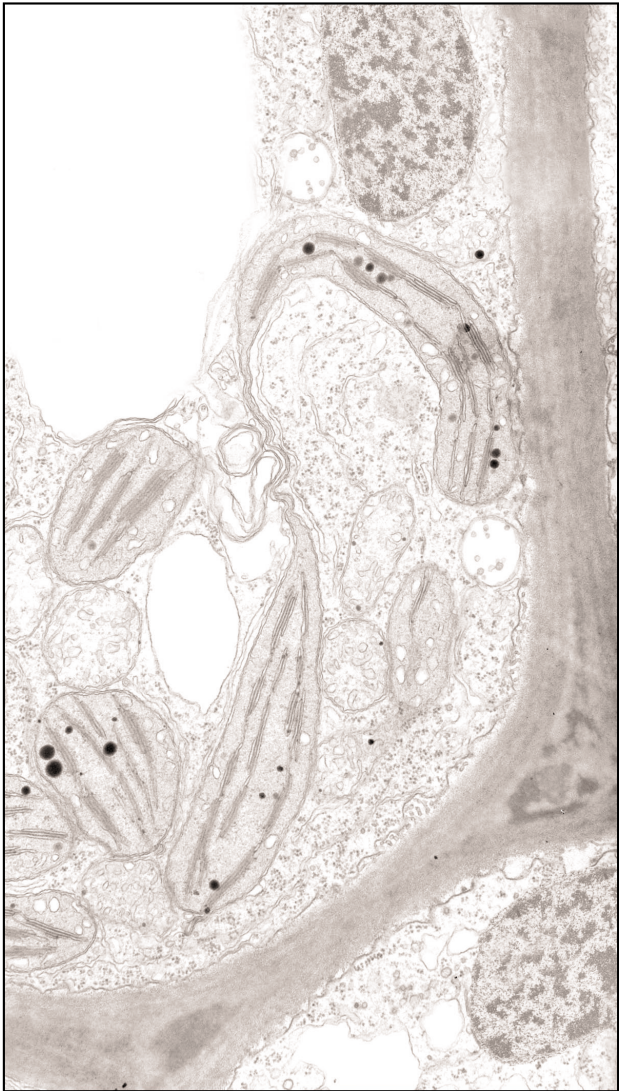
Surrounding solution has higher water potential than protoplast

Water lost by osmosis

Protoplast shrinks away from the cell wall



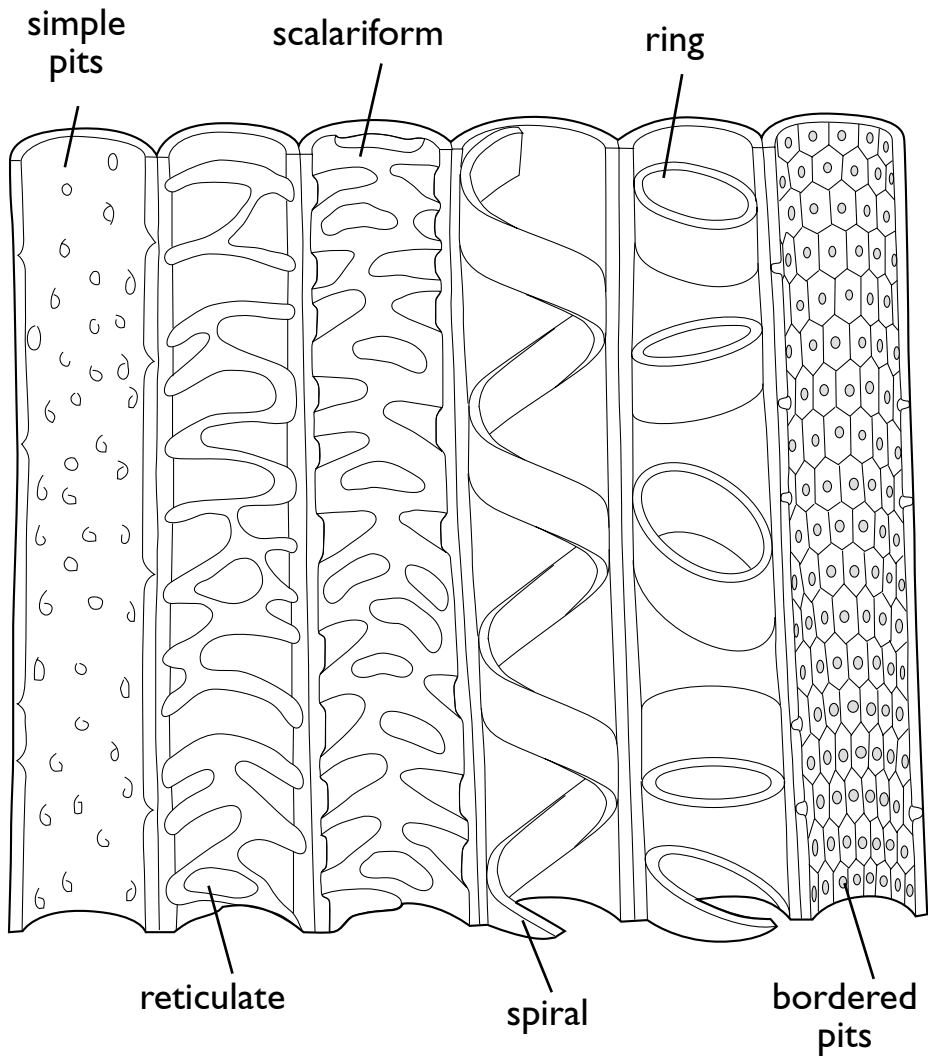
Electronmicrograph of plant cell



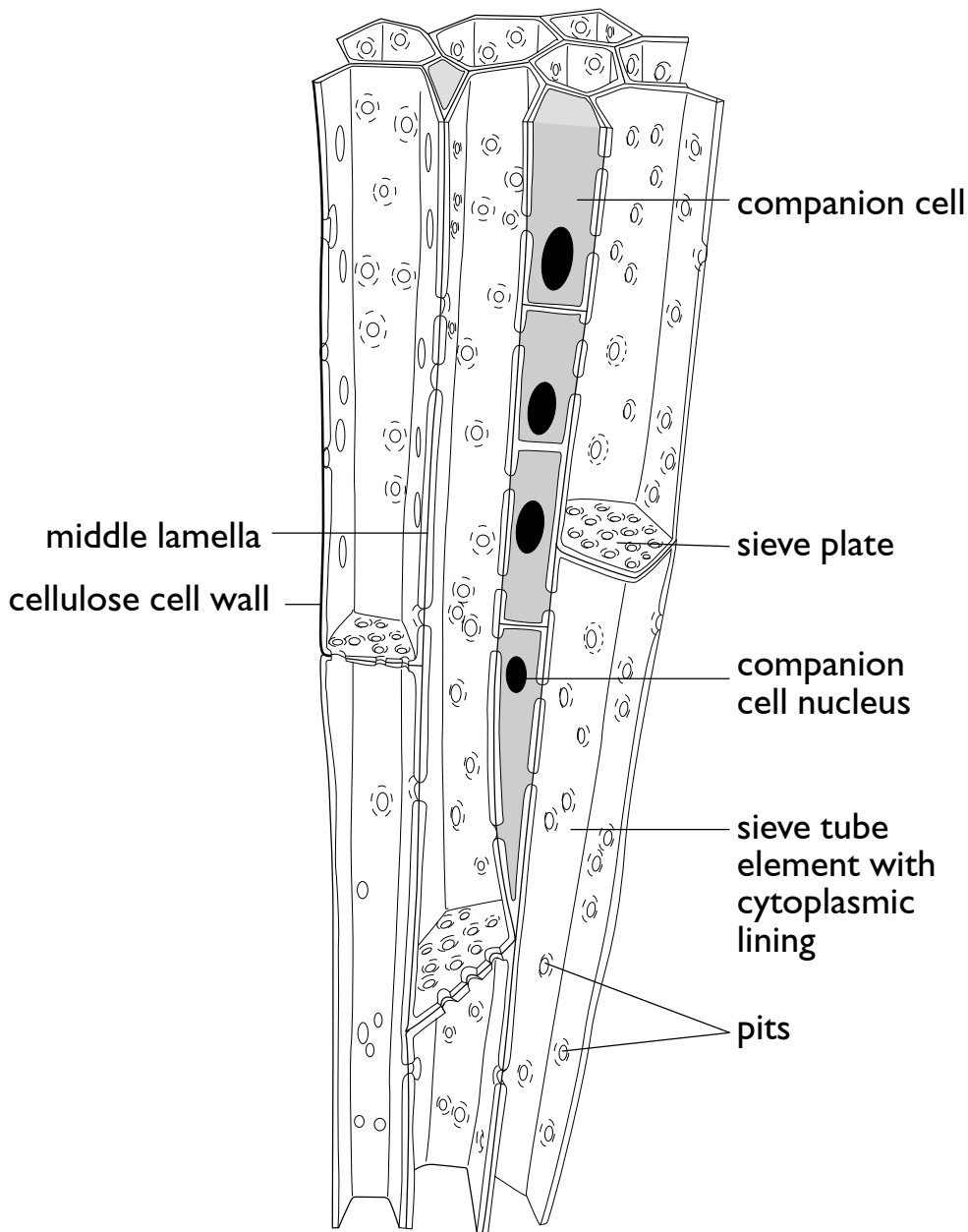
PLANT TISSUES

Structure of vessels in xylem

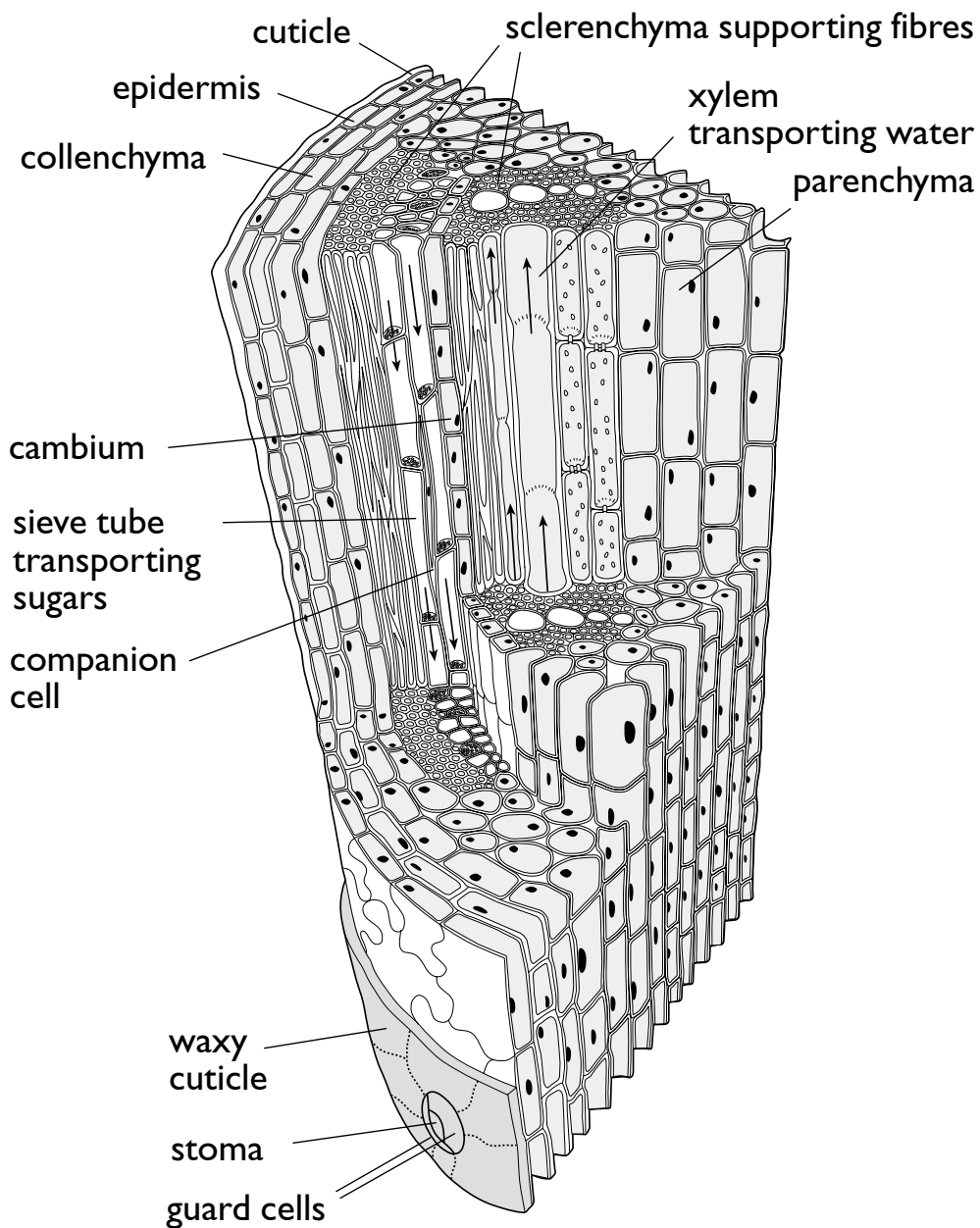
Xylem vessels showing different types of lignified thickening

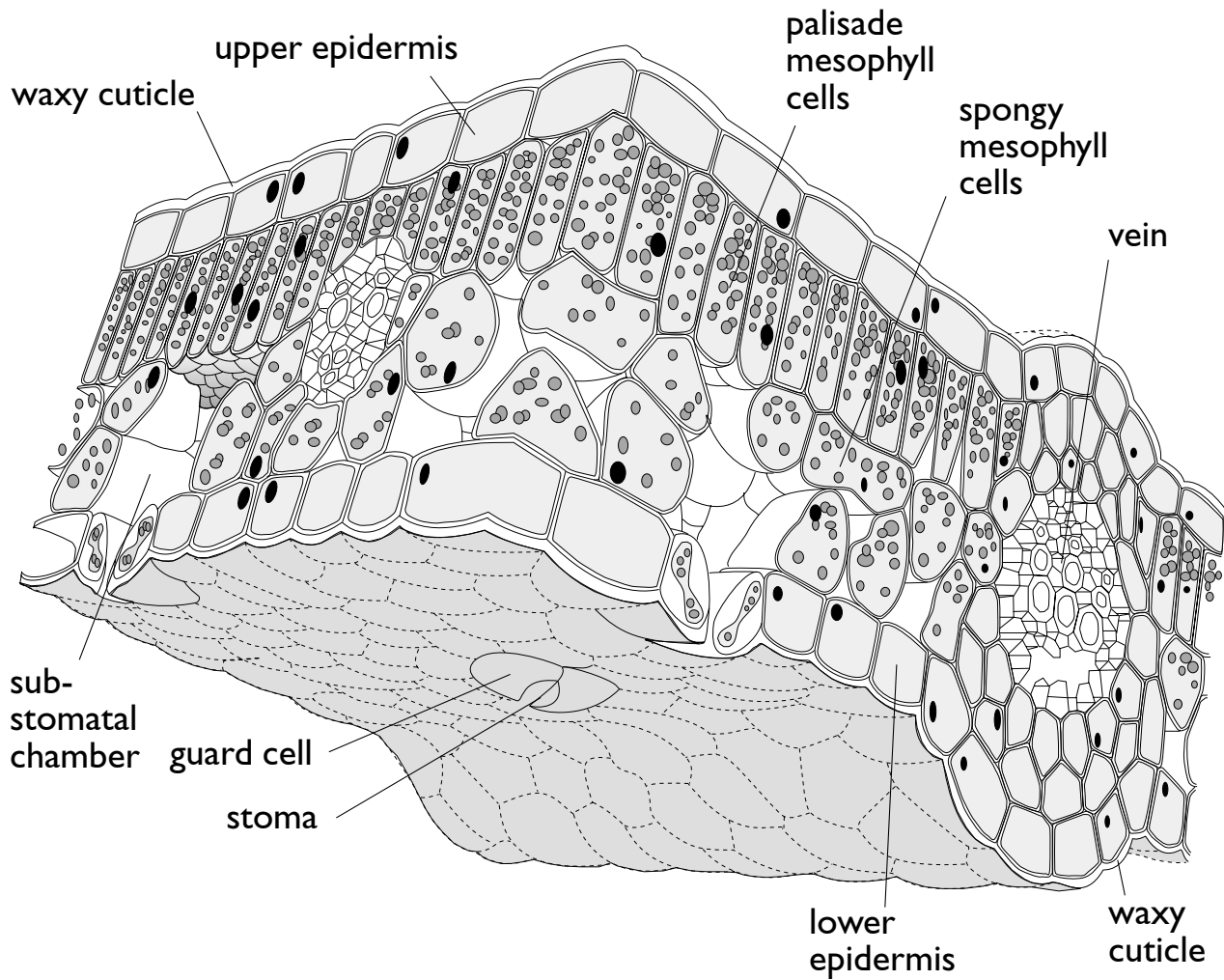


Structure of sieve tube elements and companion cells in phloem



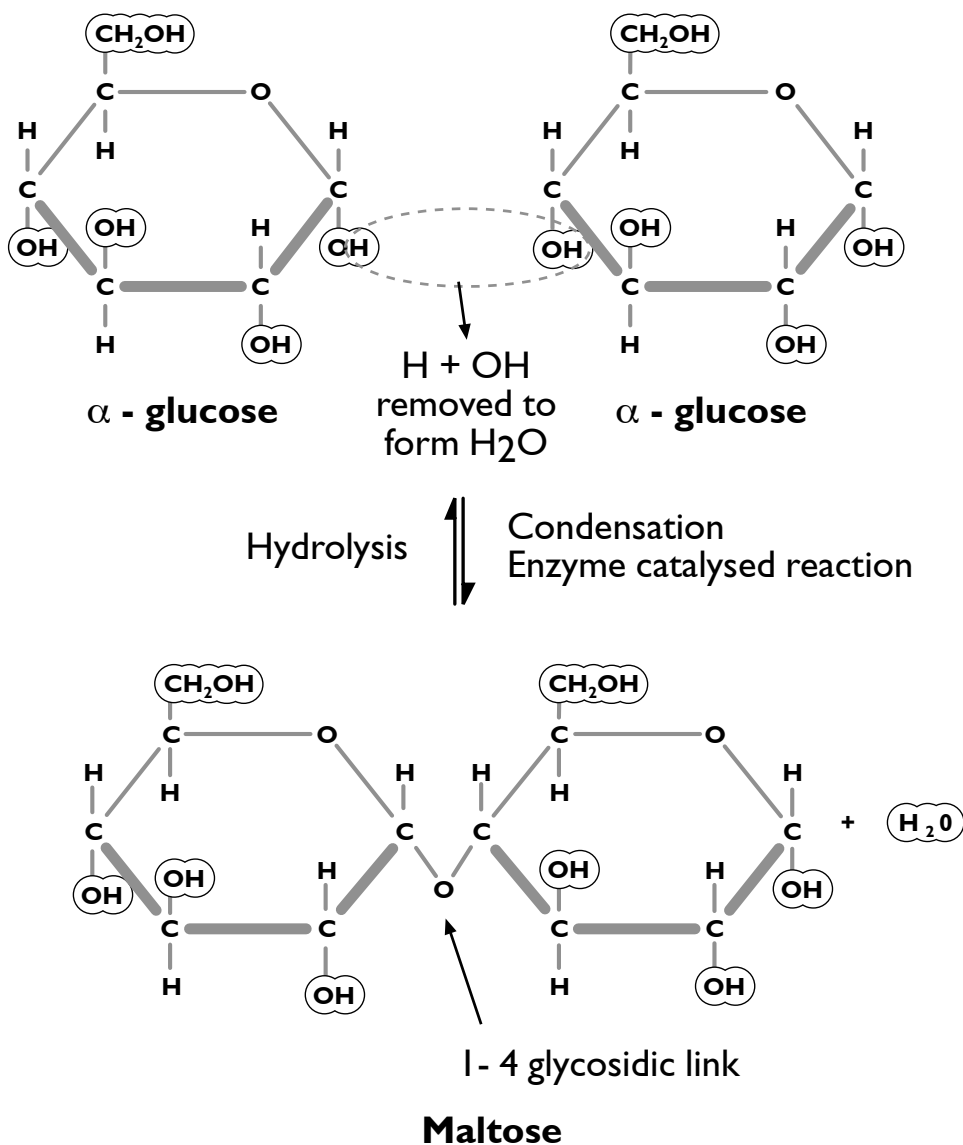
Xylem and phloem T.S. and L.S.





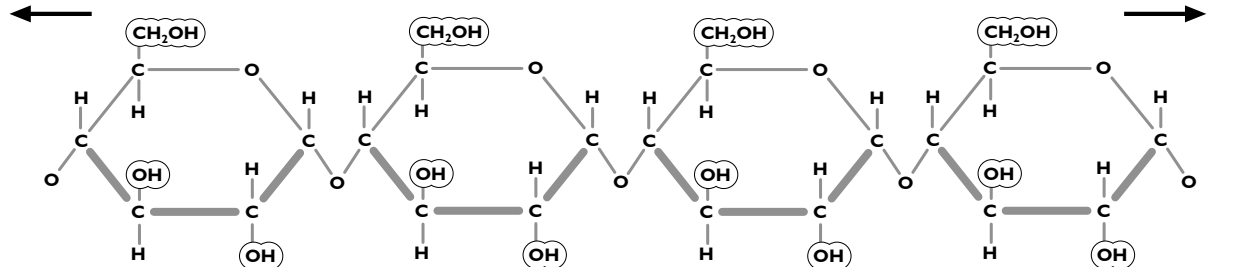
MOLECULAR STRUCTURE OF THE CELL

Monosaccharides and disaccharides

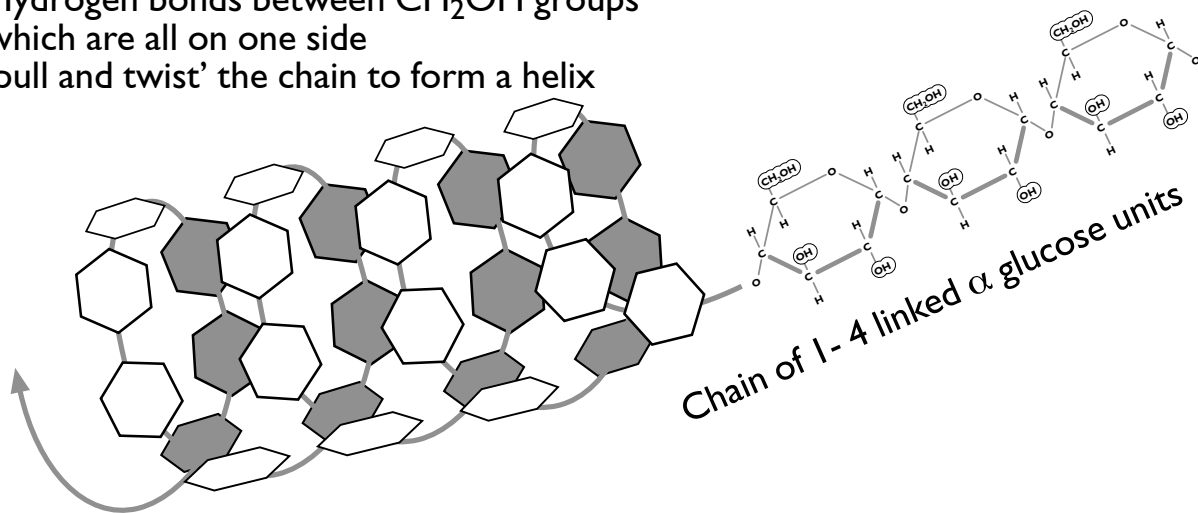


Part of amylose molecule chain

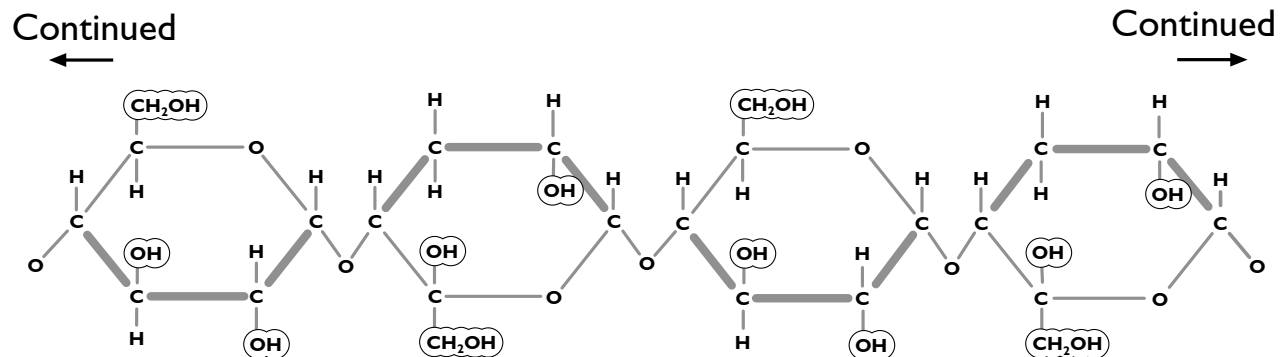
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Hydrogen bonds between CH_2OH groups which are all on one side
'pull and twist' the chain to form a helix

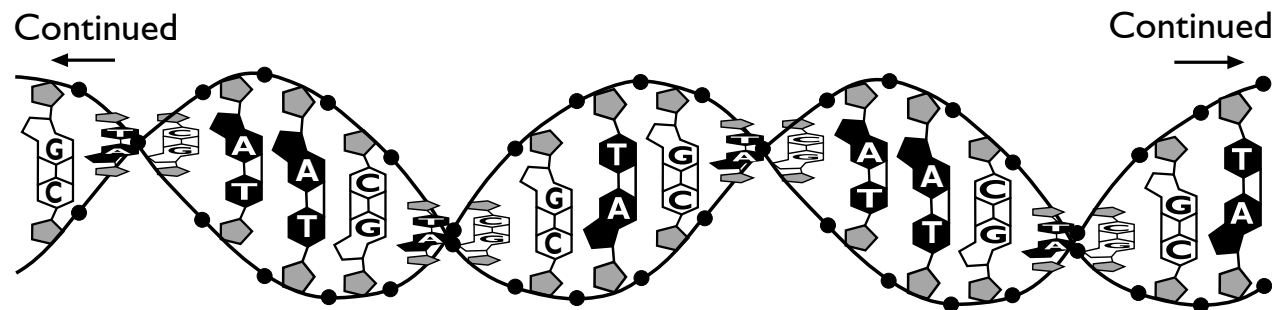


Part of a cellulose molecule chain

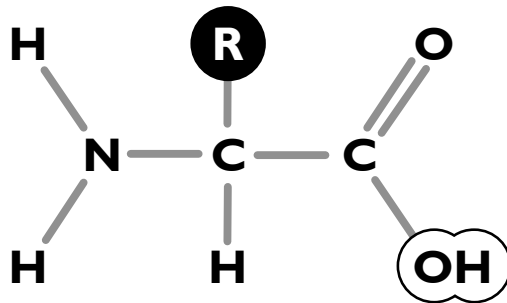


Notice how the CH_2OH groups alternate from side to side of the chain (the bonds indicated by a thick line are nearer)

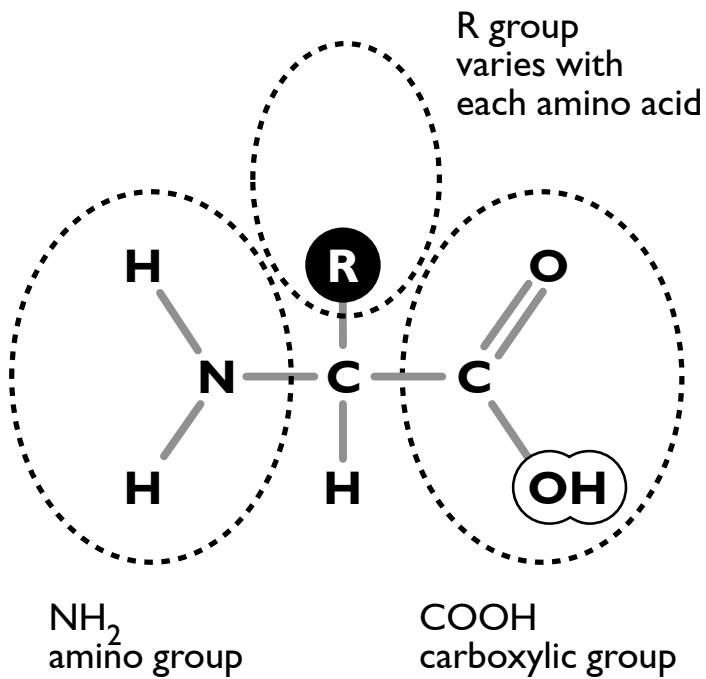
Part of a DNA double helix



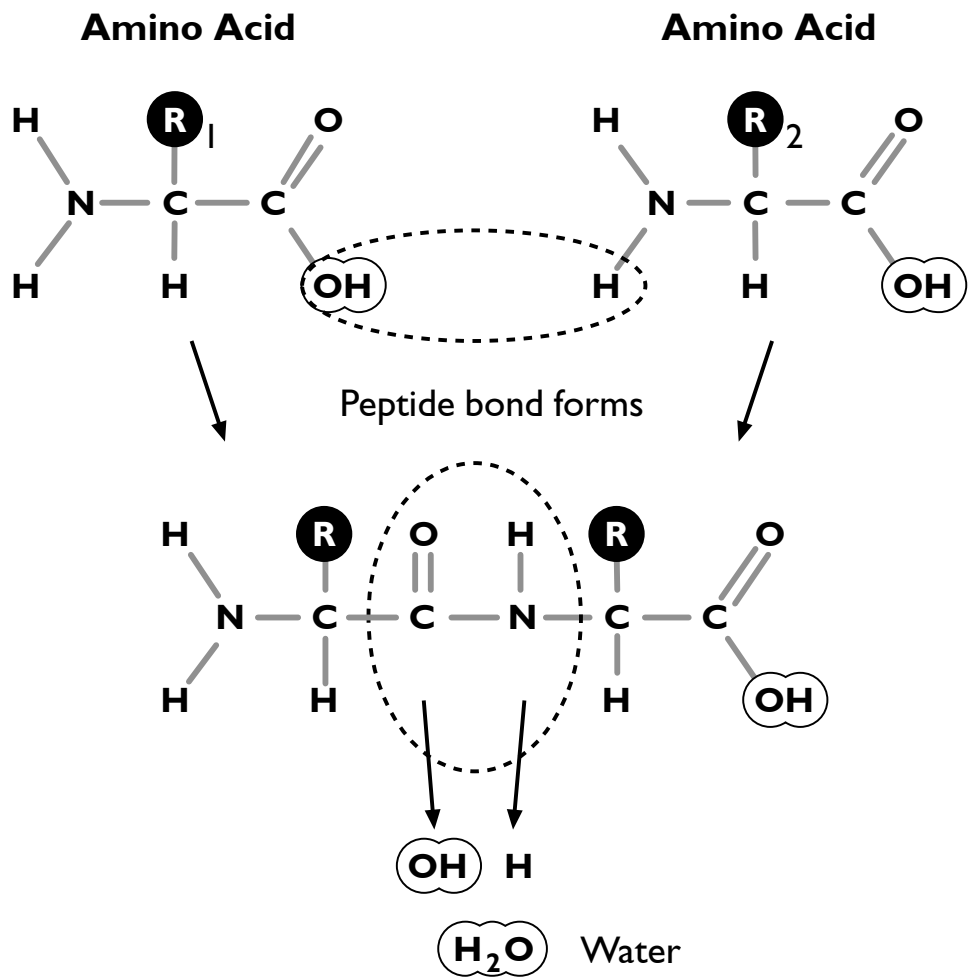
Amino acid structure



Amino Acid



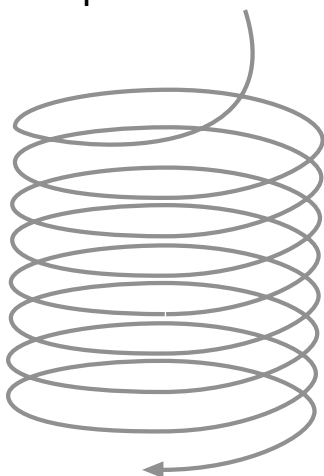
Amino acid structure and peptide bond



Secondary and tertiary structures of proteins

Secondary structure of proteins

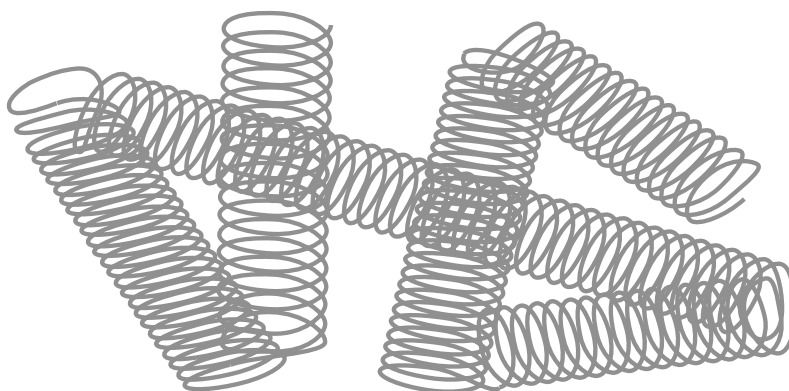
In an alpha helix hydrogen bonds 'pull' molecule chain into a spiral structure



In a beta sheet hydrogen bonds hold and align molecule chains side by side. Angle of bonds in each chain are as a consequence perfectly aligned forming 'pleats'.

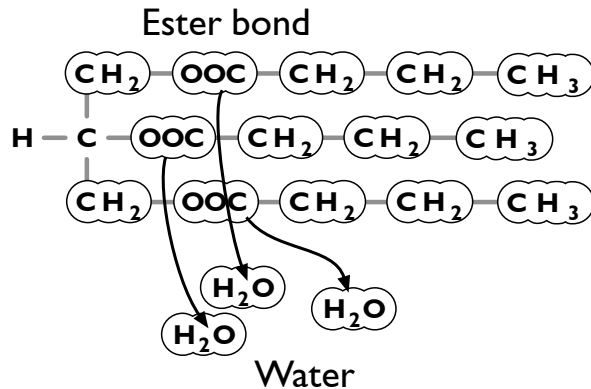
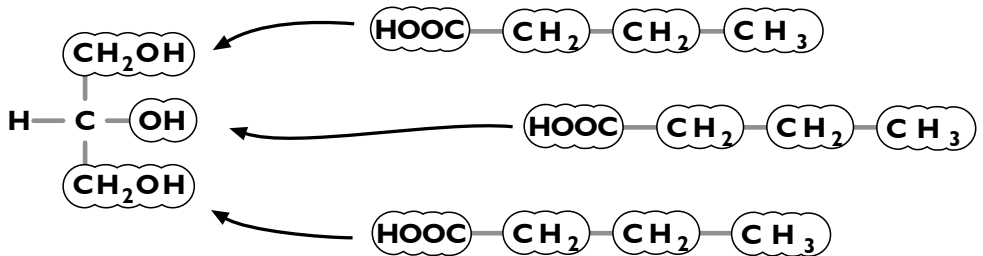


Tertiary structure of proteins

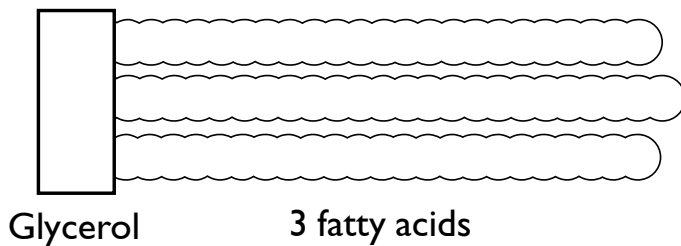


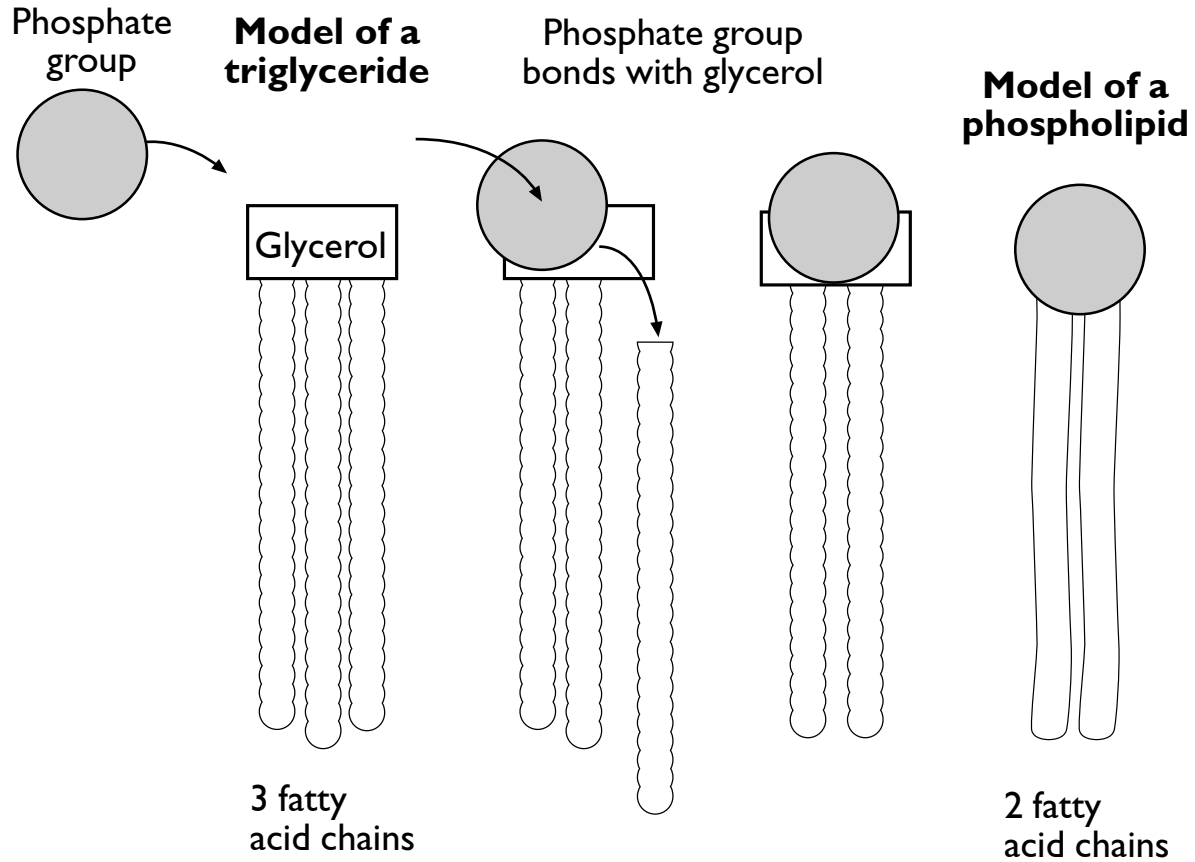
The alpha helix chain folds around itself forming a third level of structural organisation, just like a tangled telephone flex

Structure of triglyceride

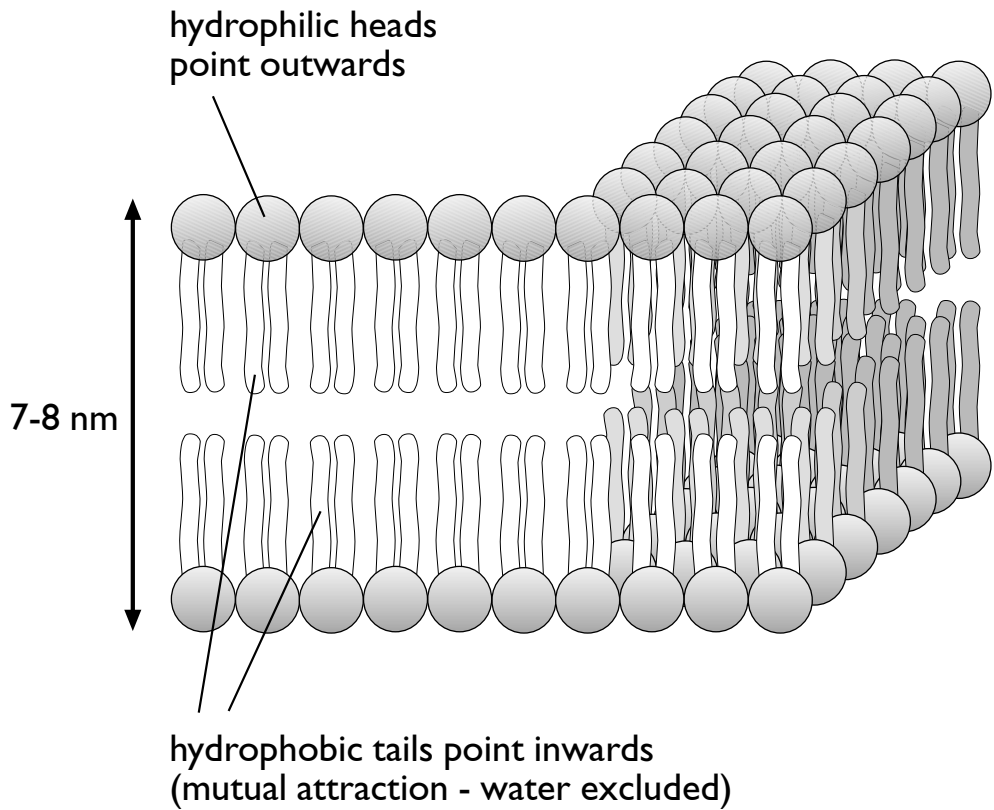


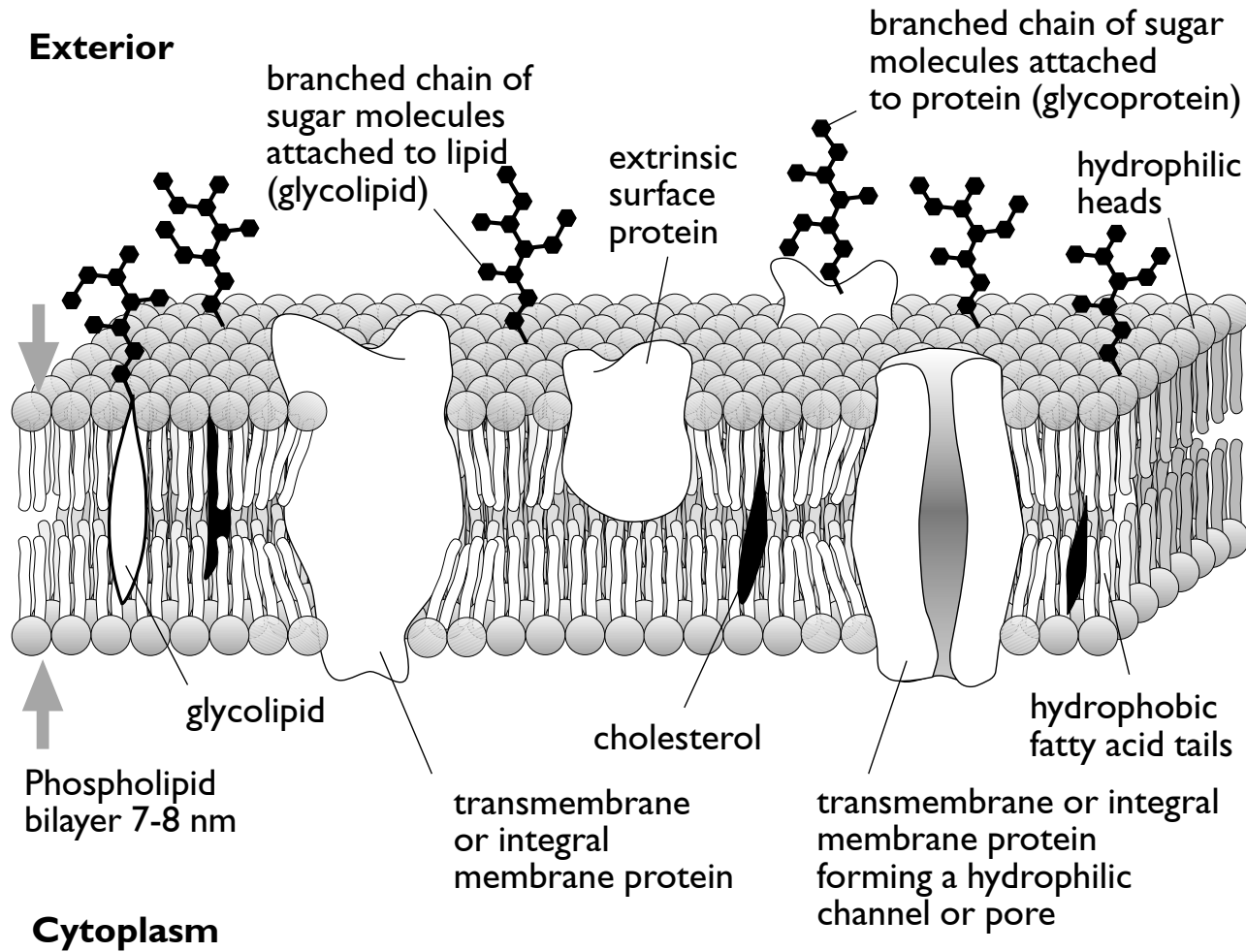
Model of a triglyceride



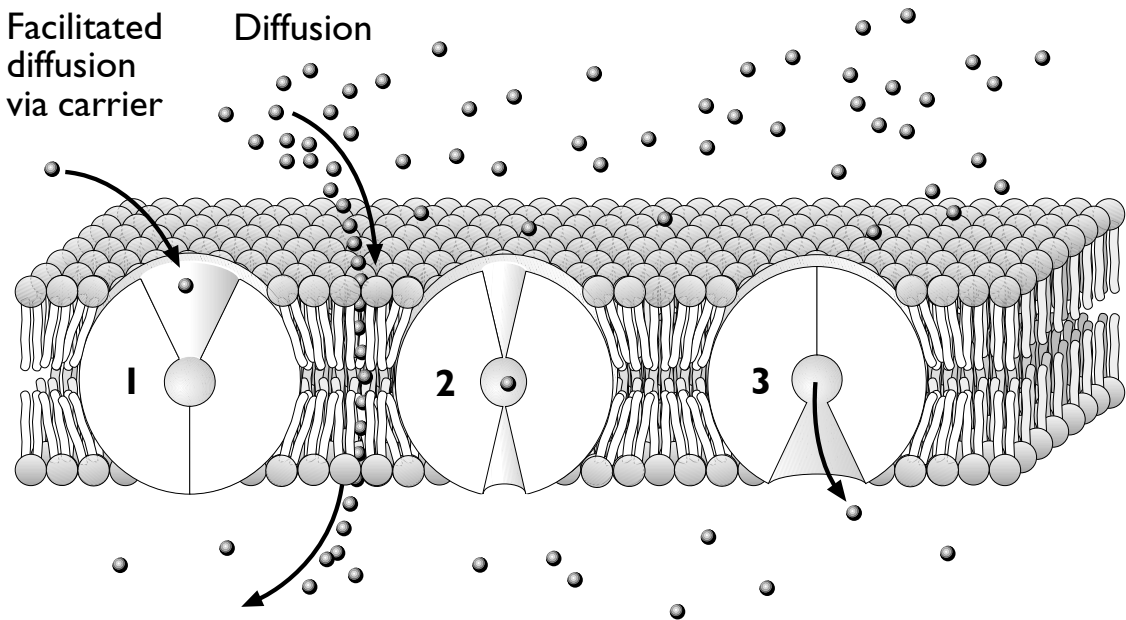


Phospholipids and the bilayer

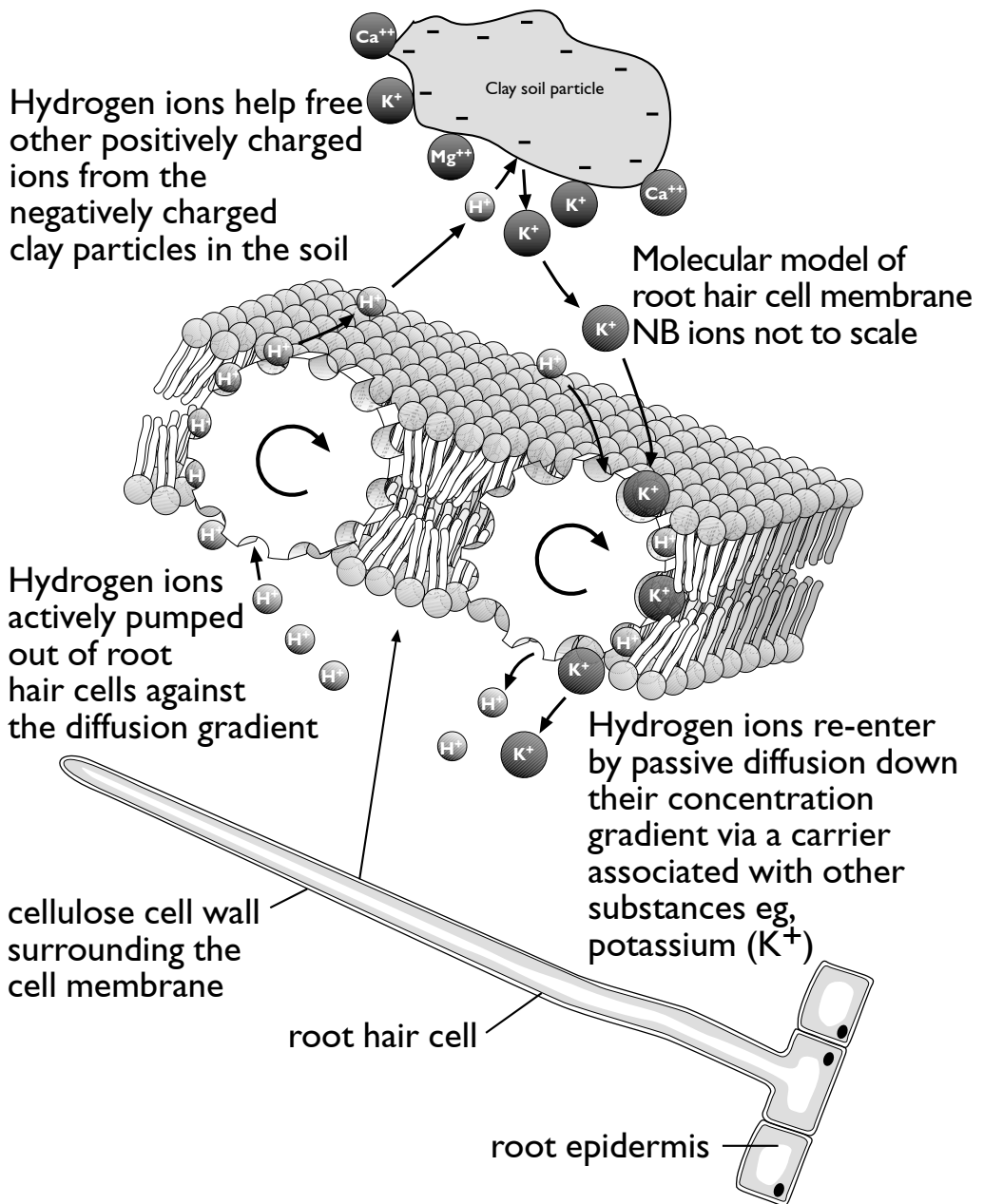




Diffusion and facilitated diffusion

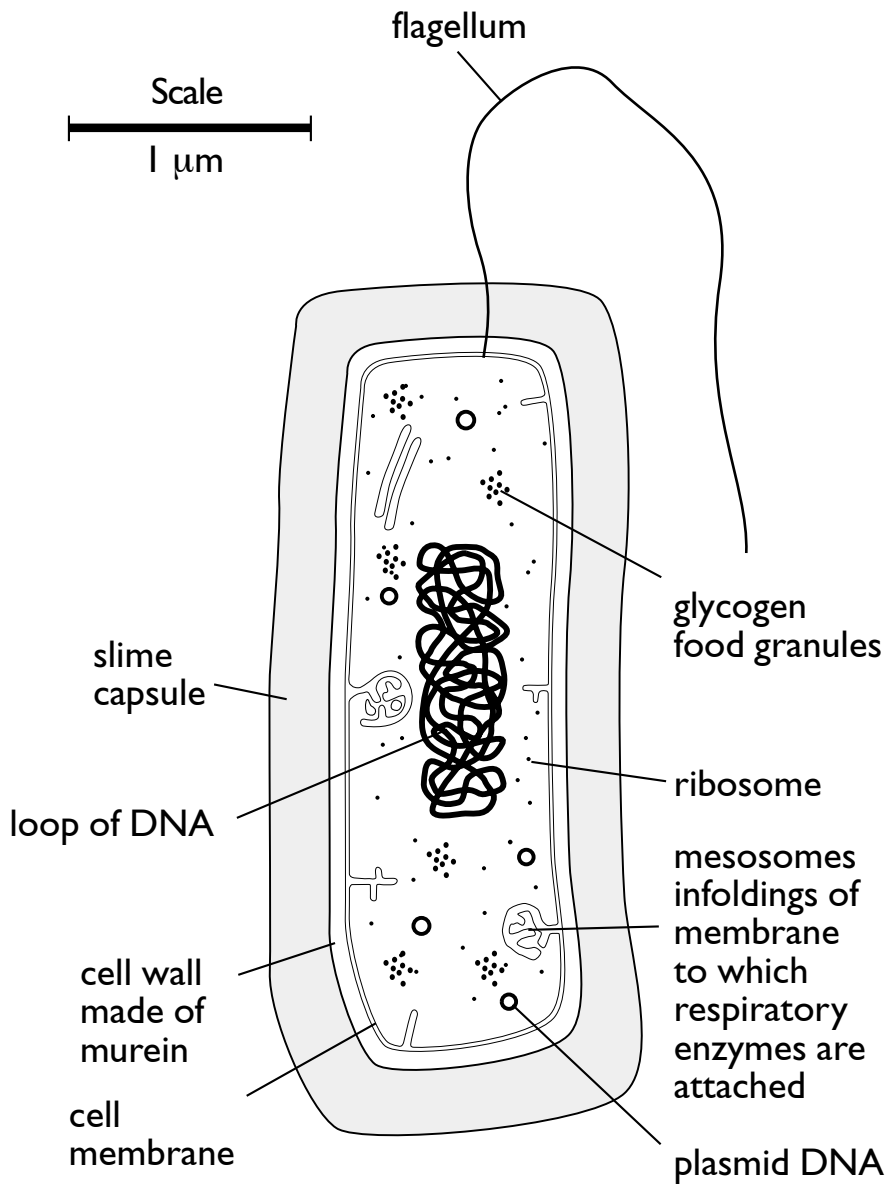


Cation exchange by root hairs



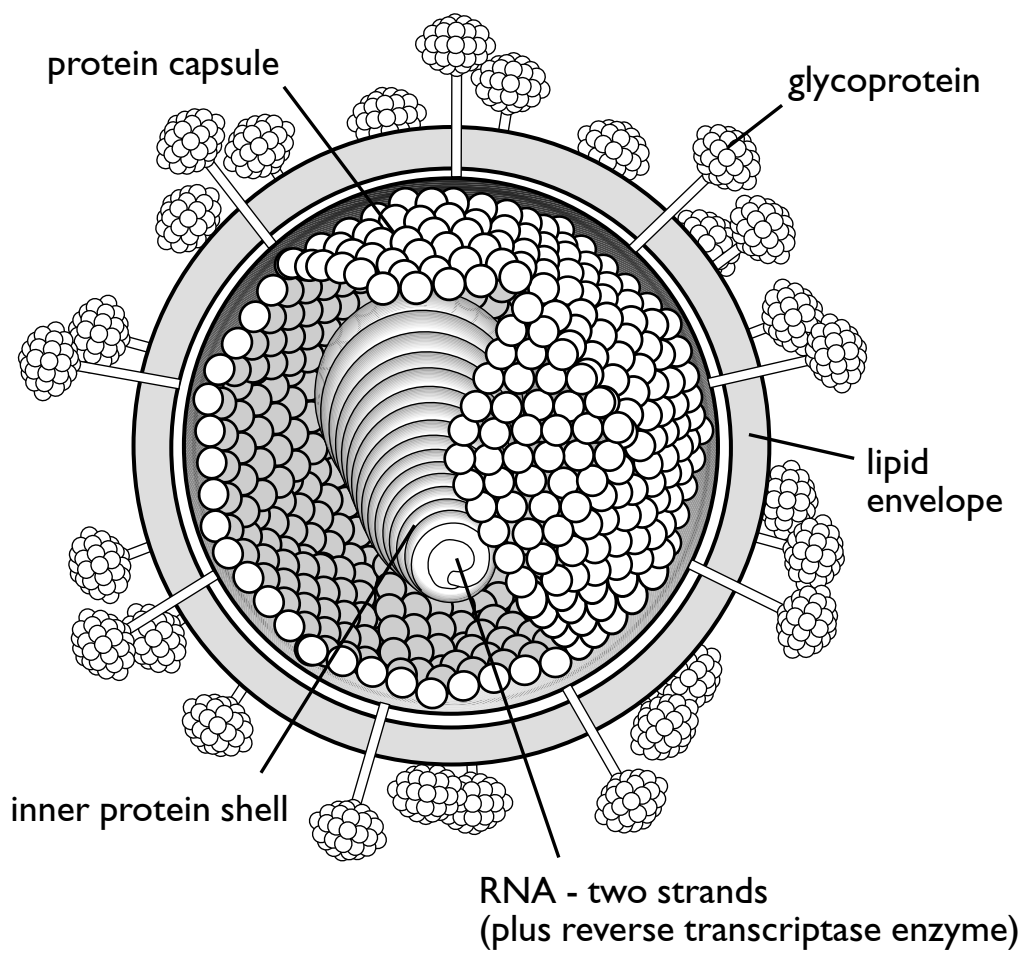
Cellular Defence Against Disease

Structure of bacterium

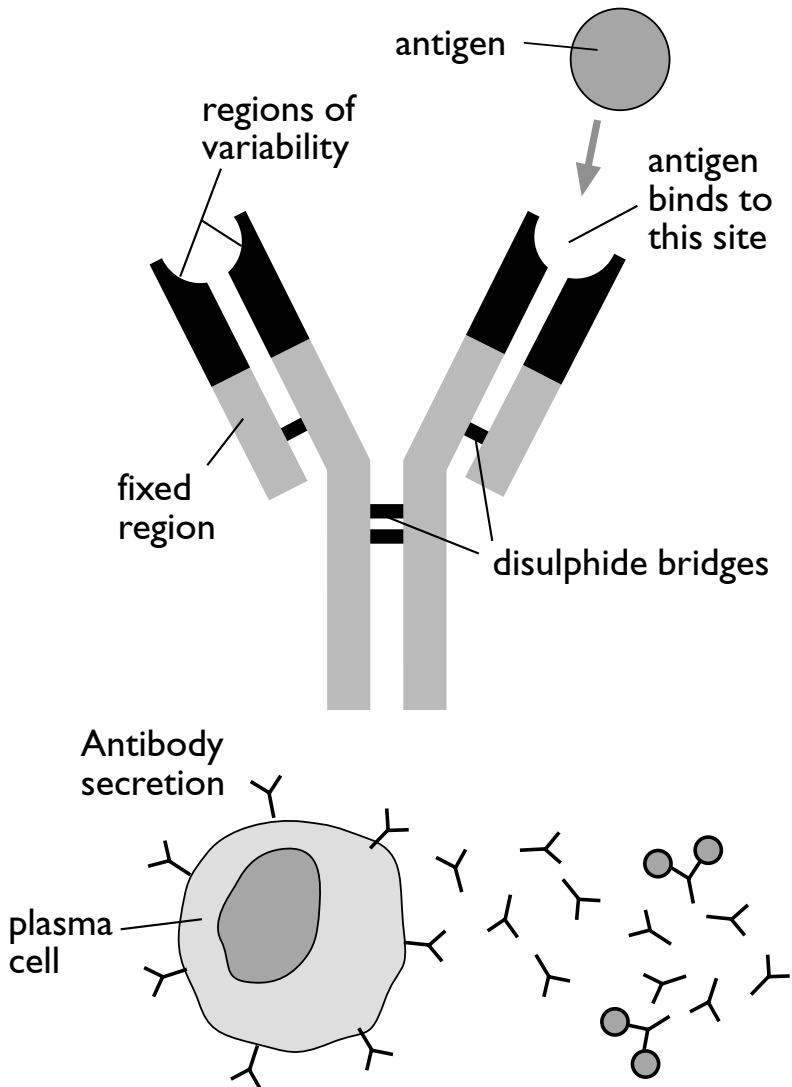


HIV virus

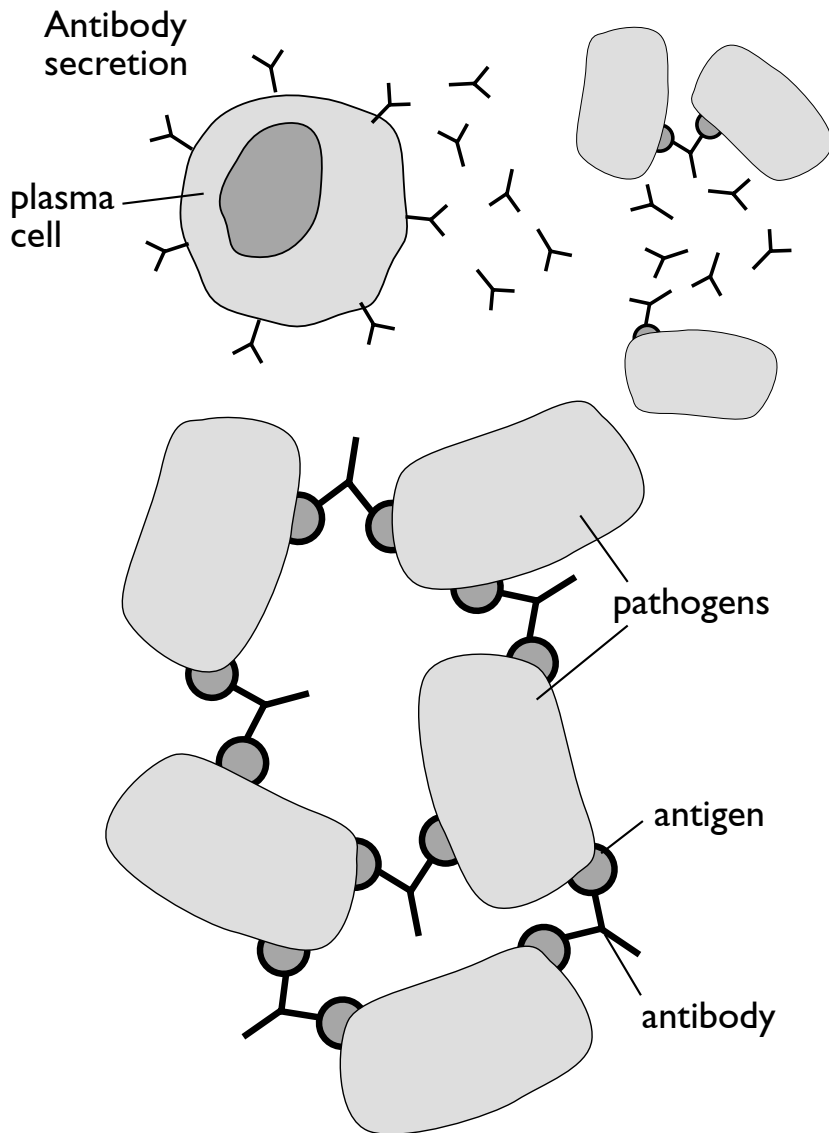
Human Immunodeficiency Virus



Antibody structure



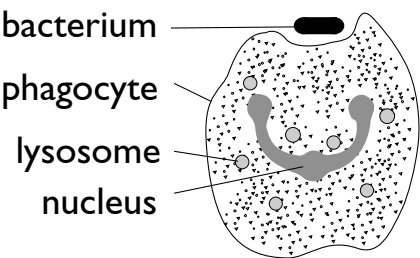
Antibodies bind pathogens together



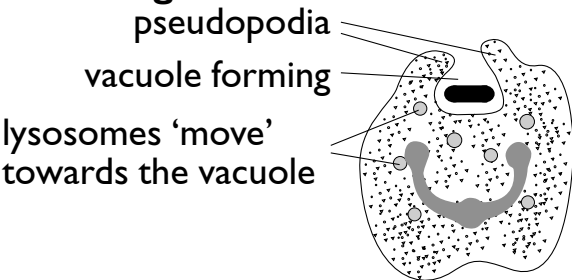
Pathogens trapped ready for phagocytosis

Phagocytosis

Phagocyte ‘moves’ towards bacterium

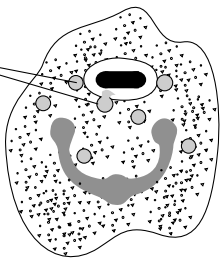


Vacuole forming

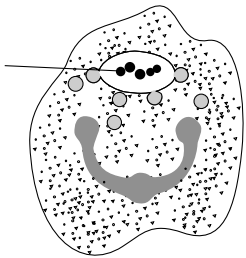


Vacuole formed

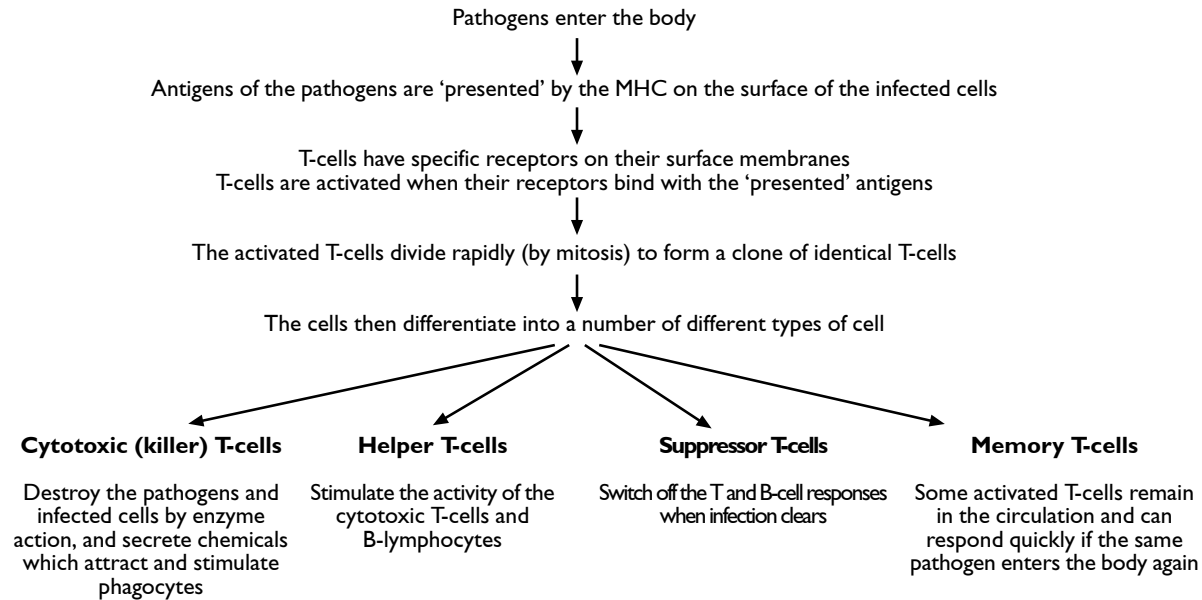
lysosomes collect around the vacuole fuse with it releasing digestive enzymes

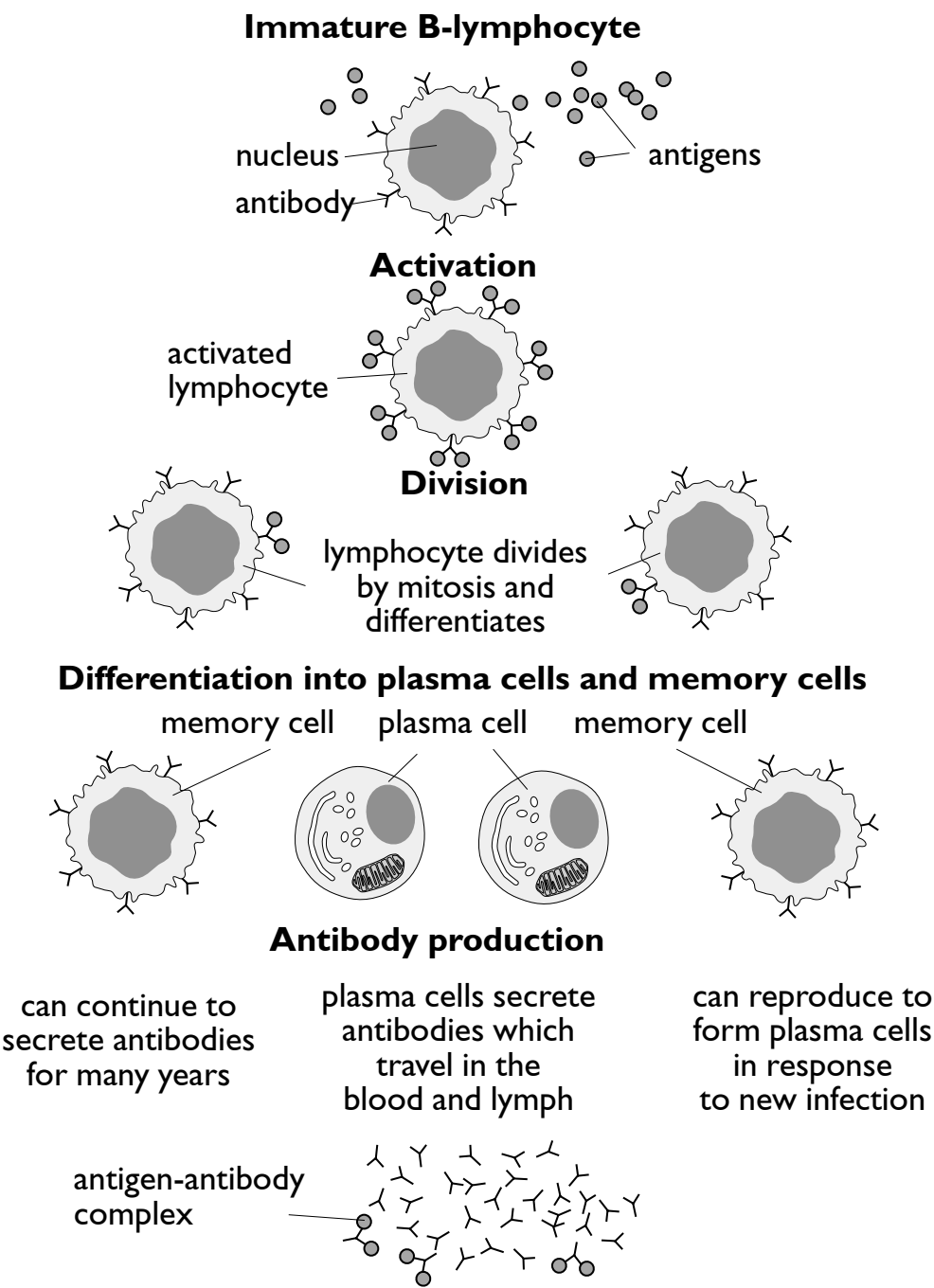


bacterium digested and products absorbed



Cellular response to infection - T-lymphocytes (T-cells)





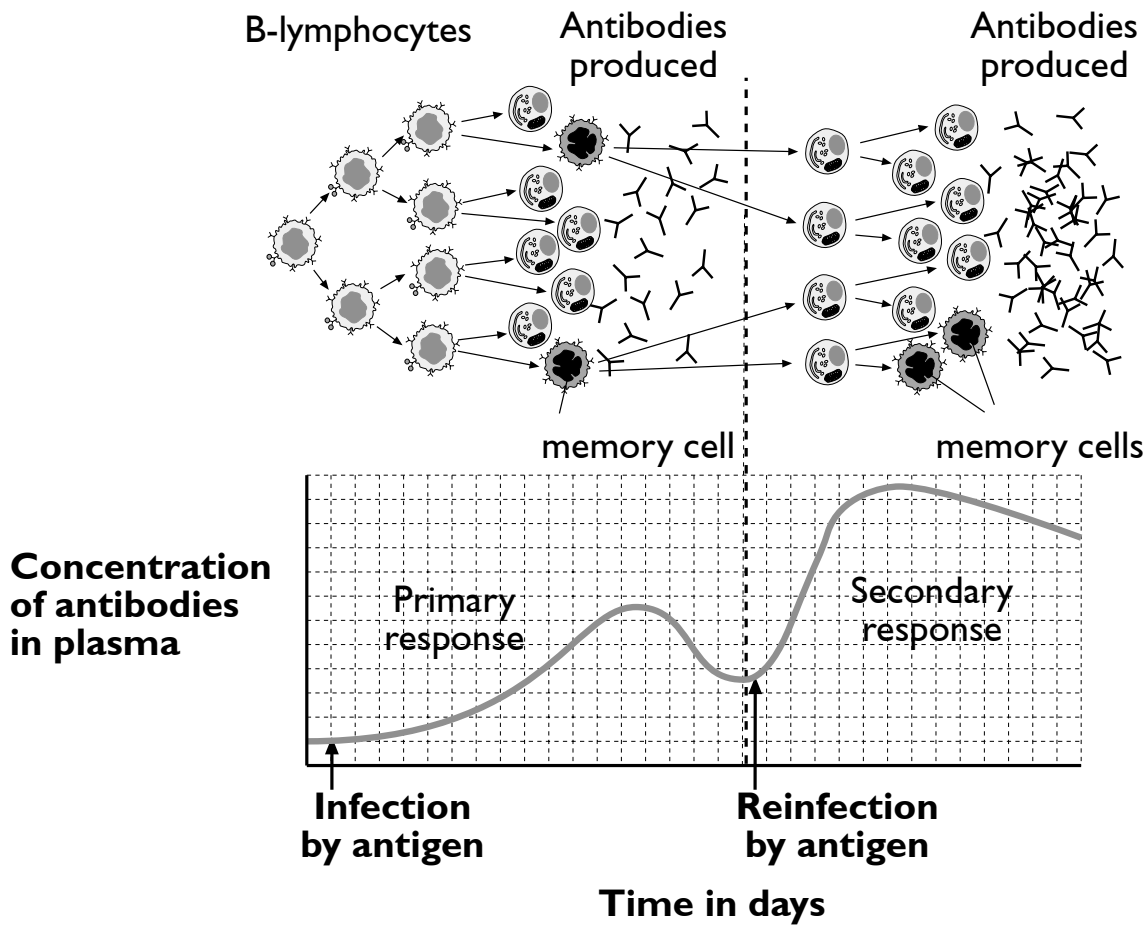
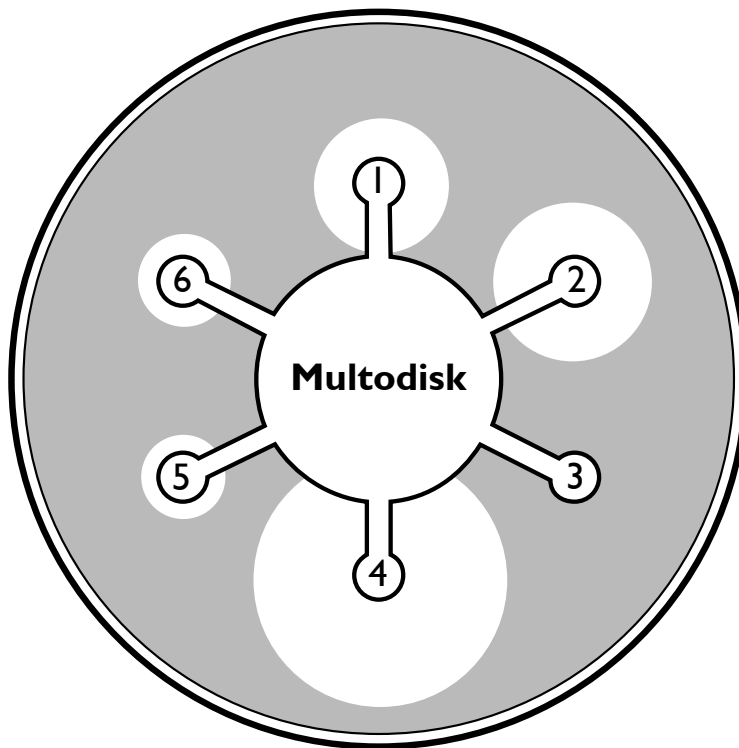
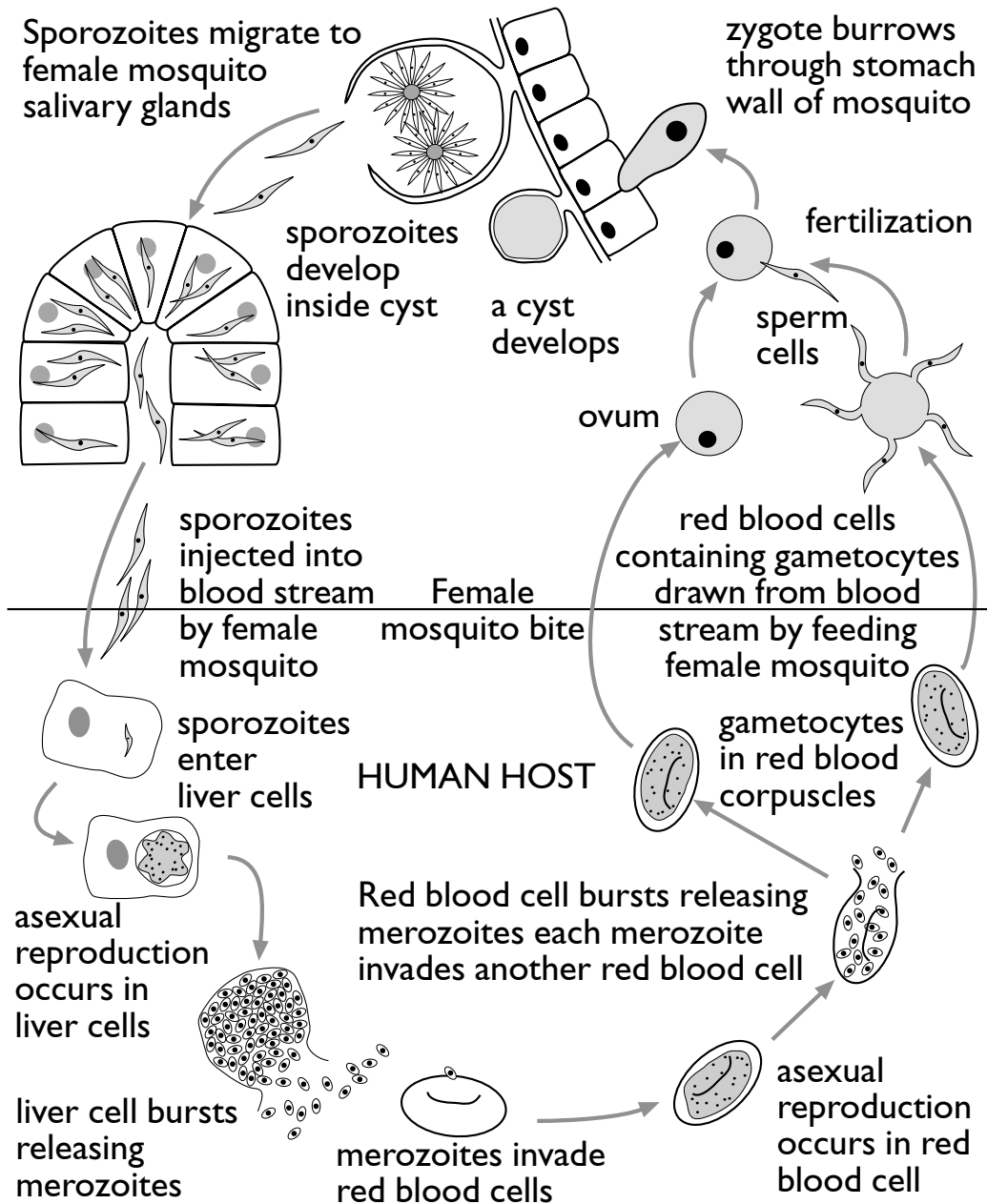


Diagram to show action of specific antibiotics on a bacterial culture



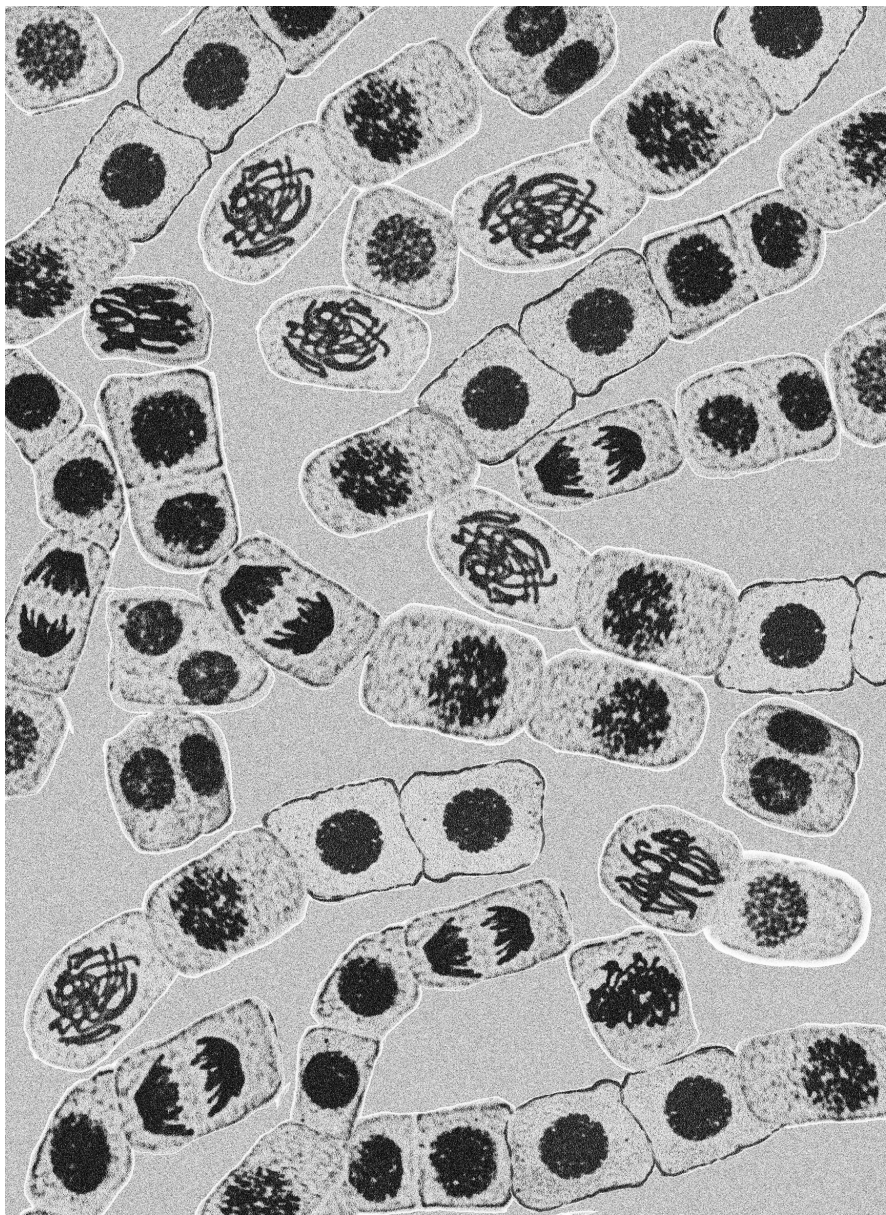
- 1 Tetracycline
- 2 Chloraphenol
- 3 Erythromycin
- 4 Sulphafurazole
- 5 Penicillin G
- 6 Streptomycin

Life cycle of Plasmodium

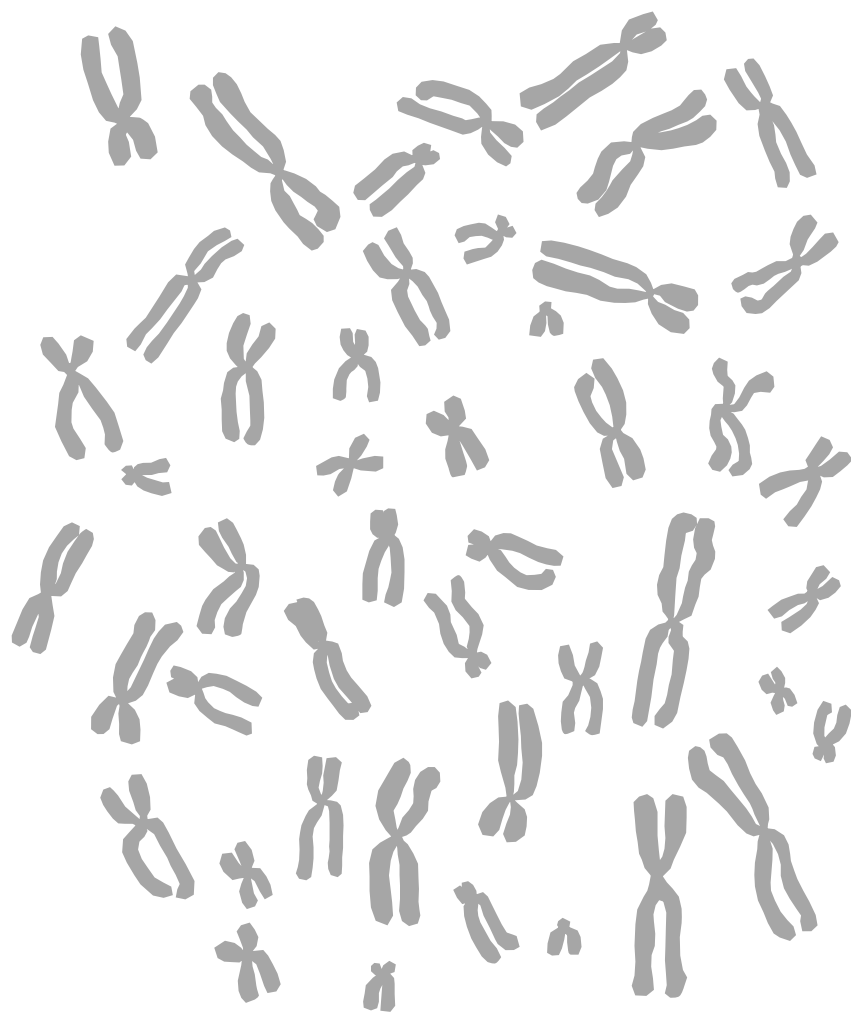


THE NUCLEUS AND NUCLEIC ACIDS

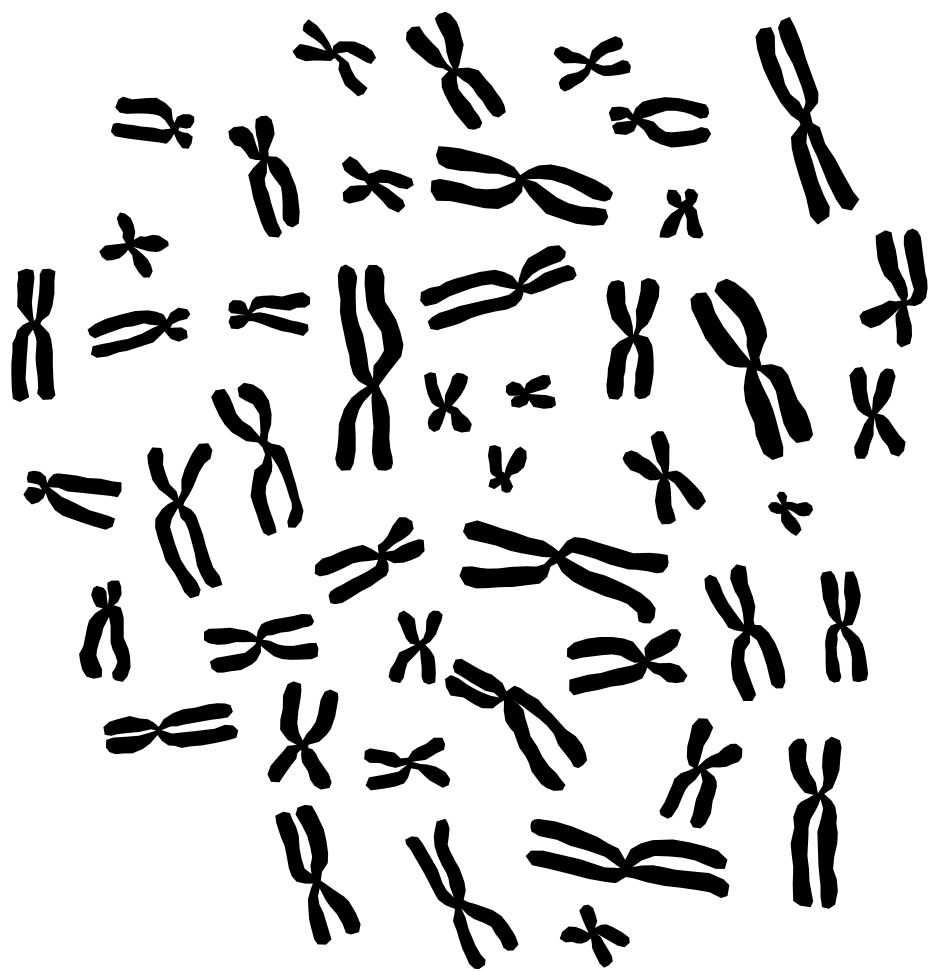
Root tip squash



Normal human karyotype - A

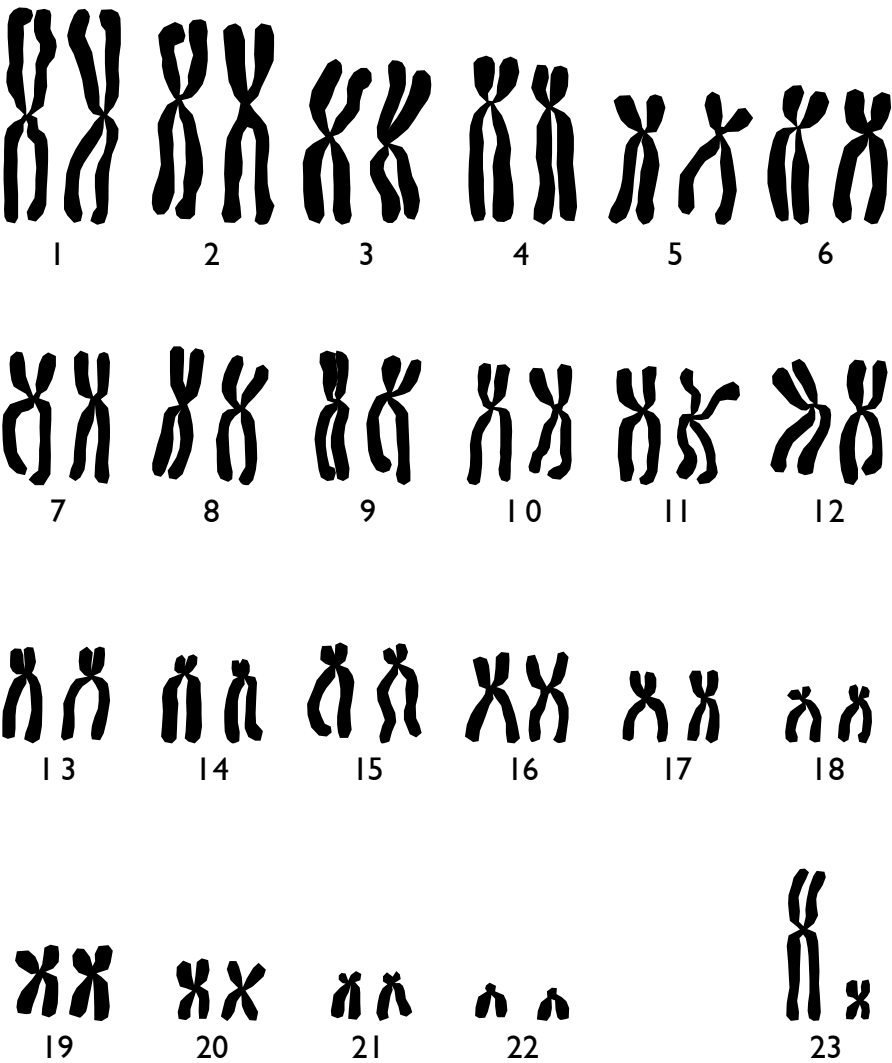


Normal human karyotype - B



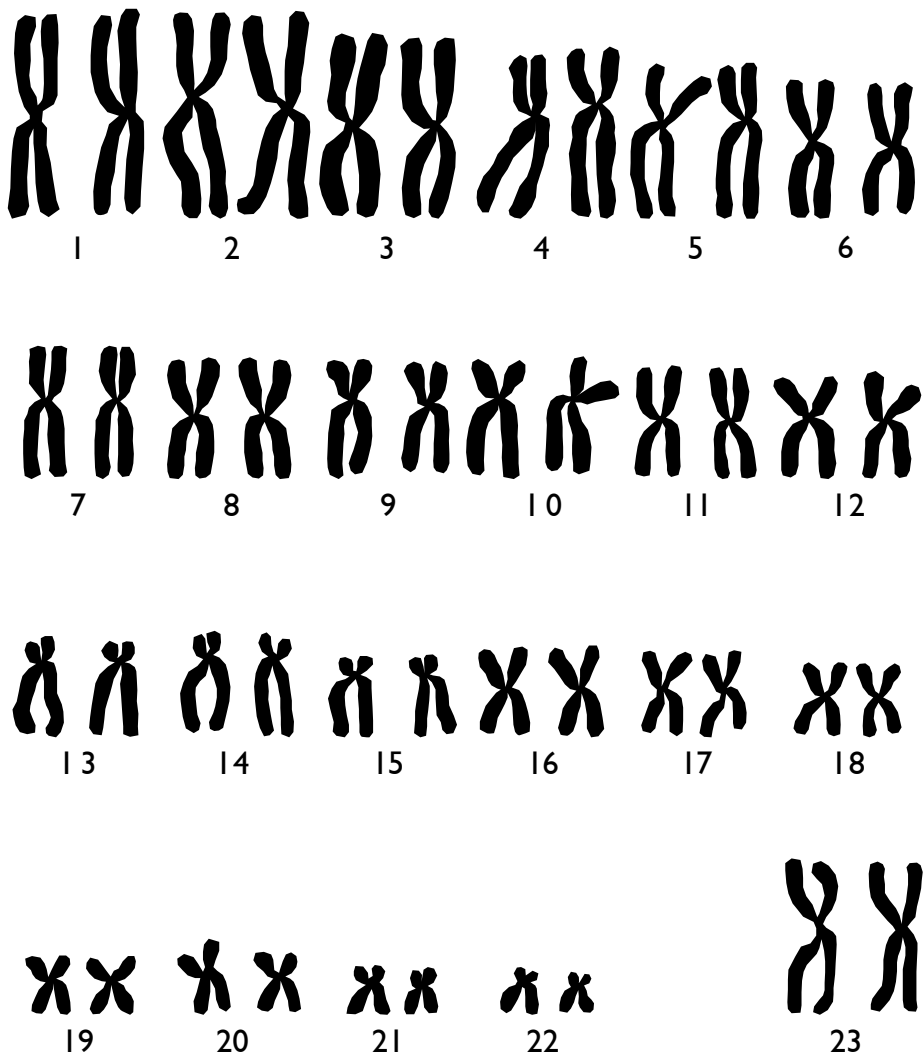
Human karyotype analysed into homologous pairs

Normal Human Male



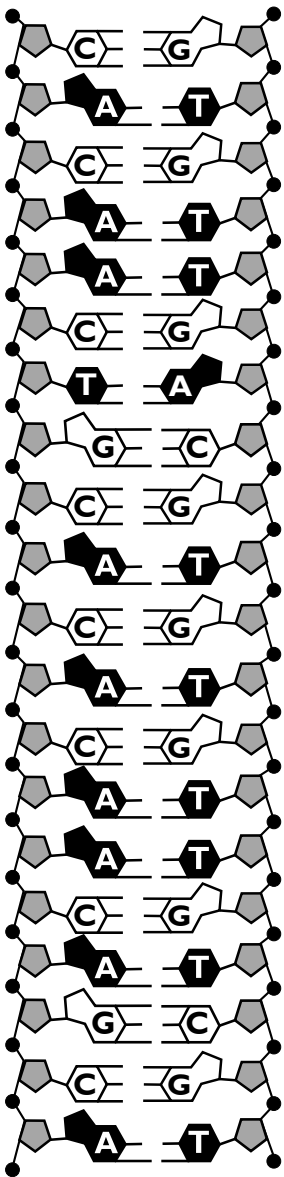
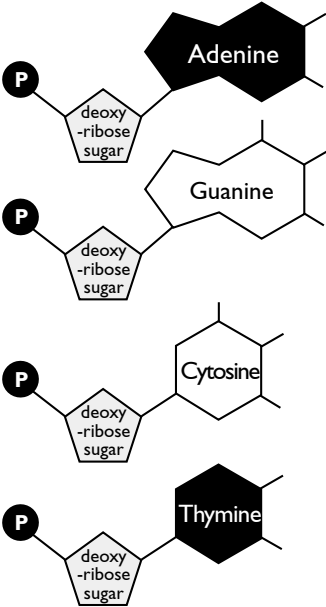
Human karyotype
analysed into homologous pairs

Normal Human Female

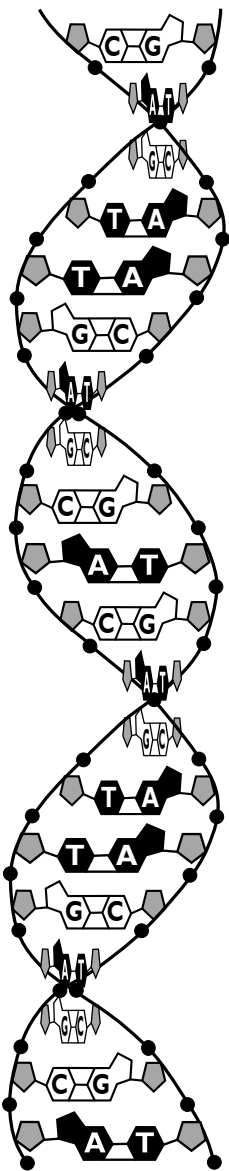


Structure of DNA

The Nucleotides of DNA

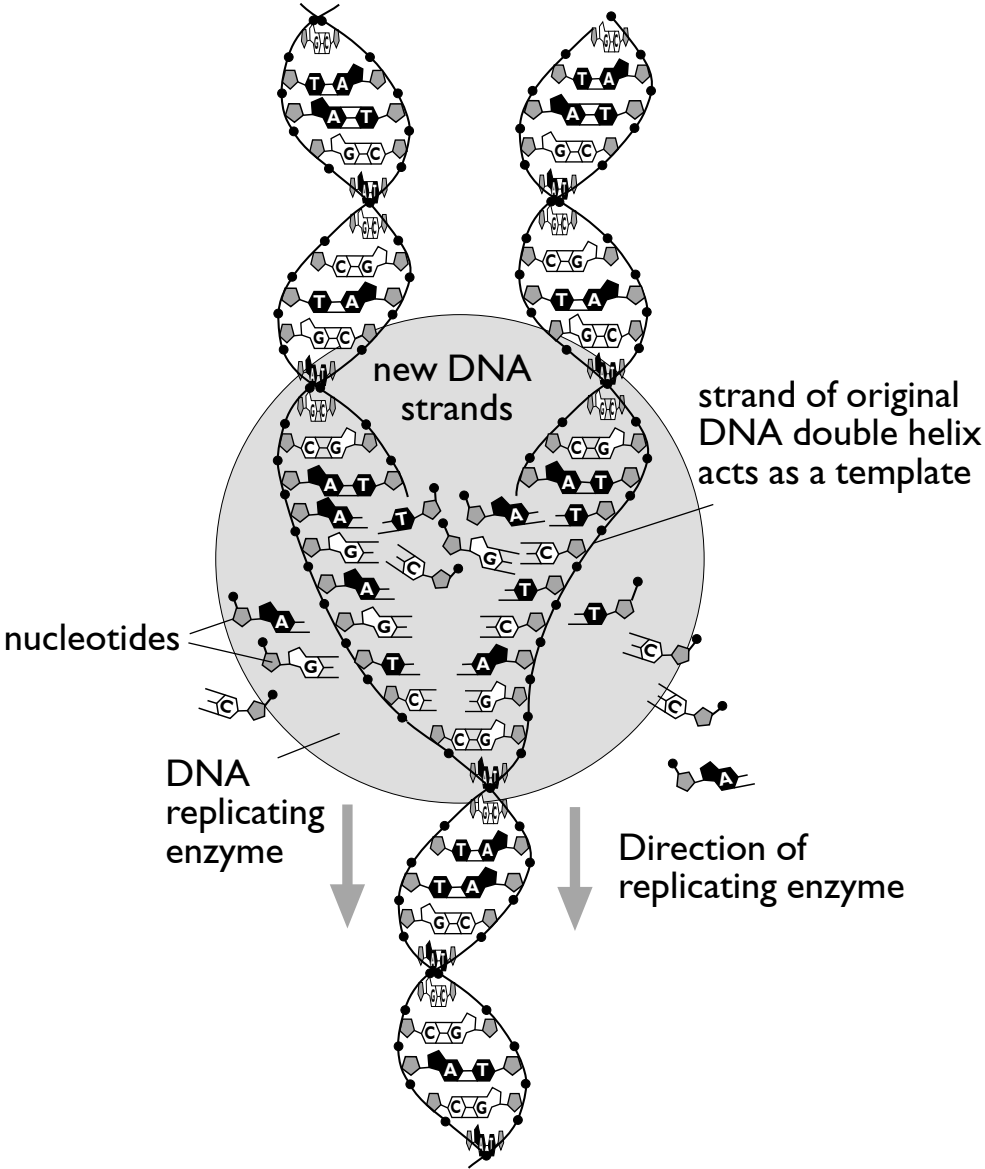


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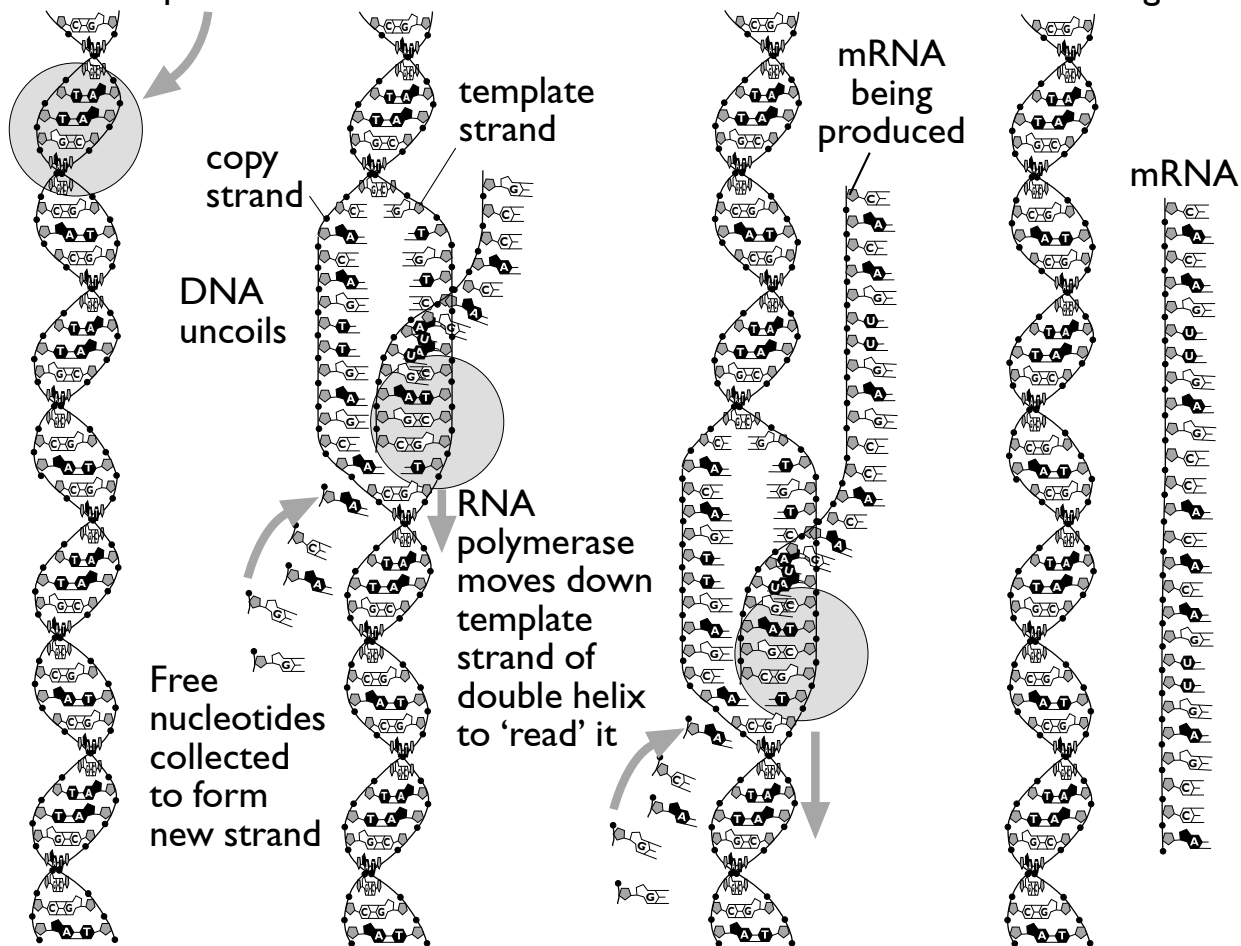
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Replication of DNA



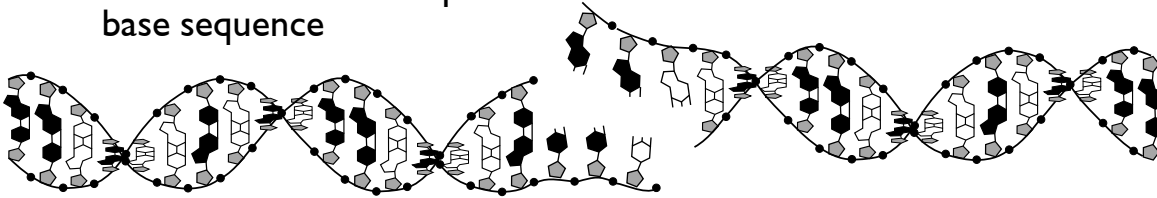
RNA polymerase attaches to DNA strand at specific codon site

DNA double helix rewinds to original

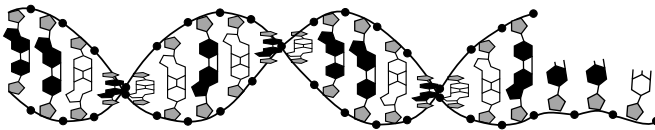


Action of restriction and ligase enzymes

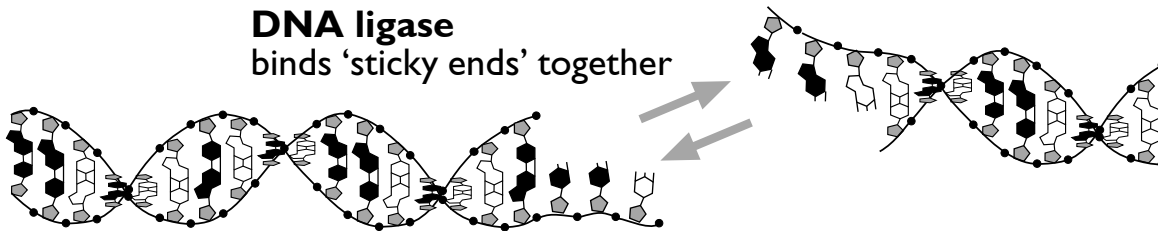
Restriction endonuclease
breaks the chain at a specific
base sequence



'Sticky end'
results from the staggered cut



DNA ligase
binds 'sticky ends' together



Translation of mRNA code to build a polypeptide

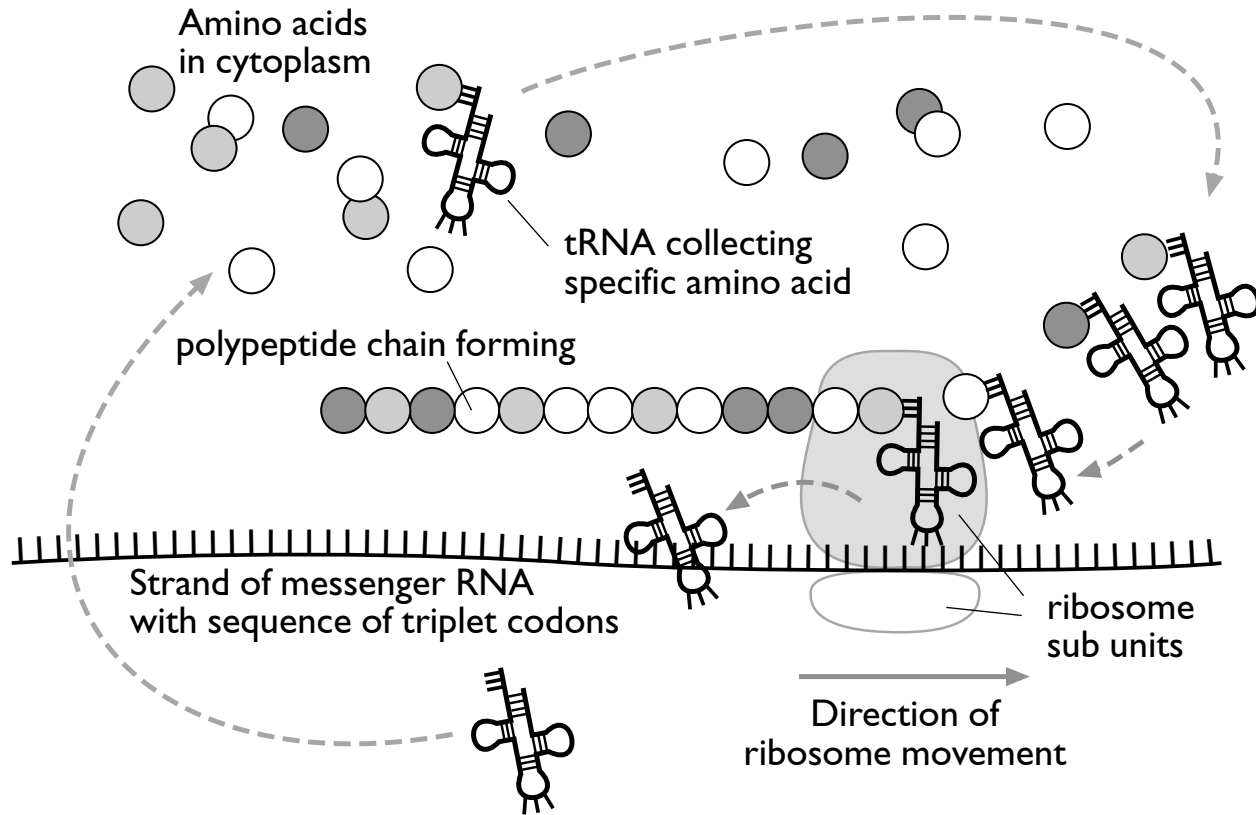
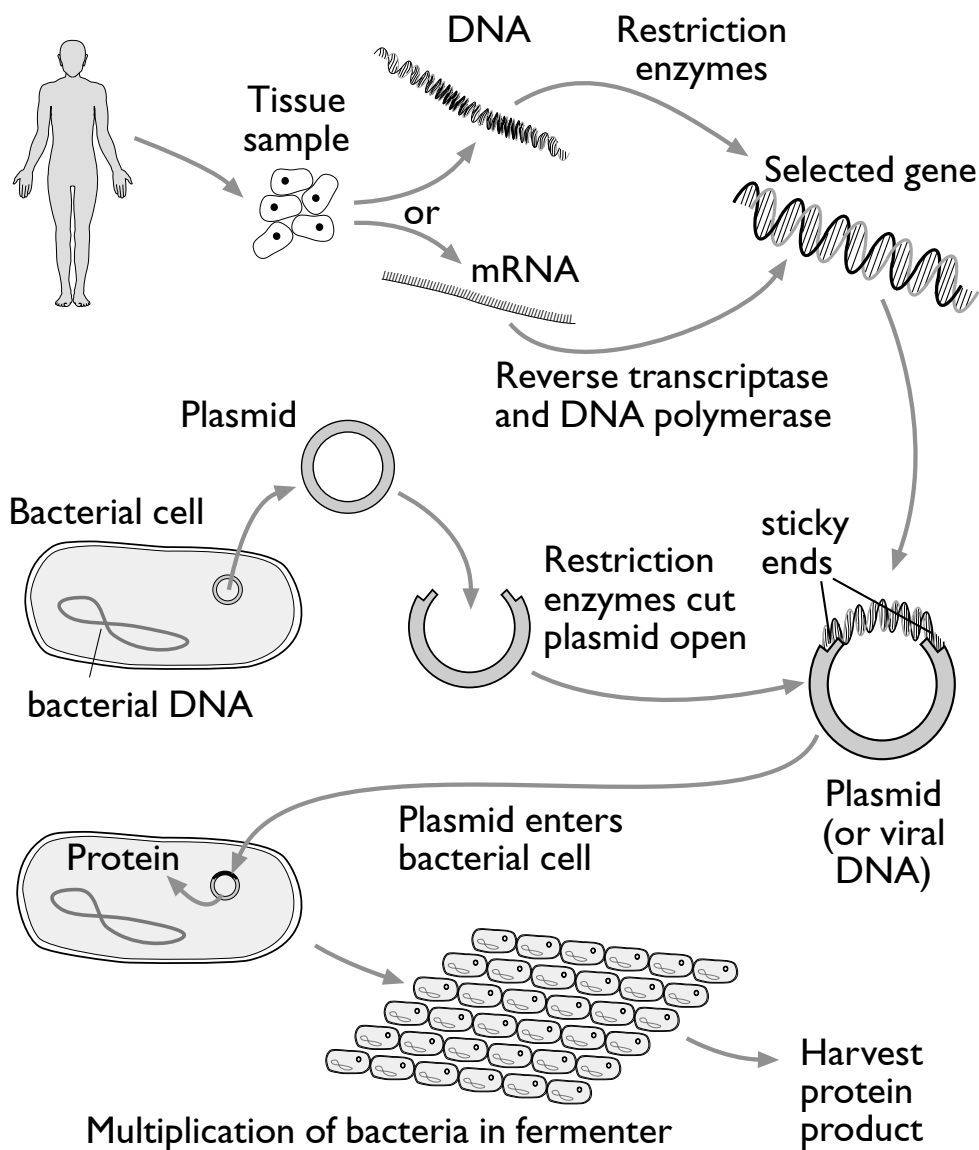


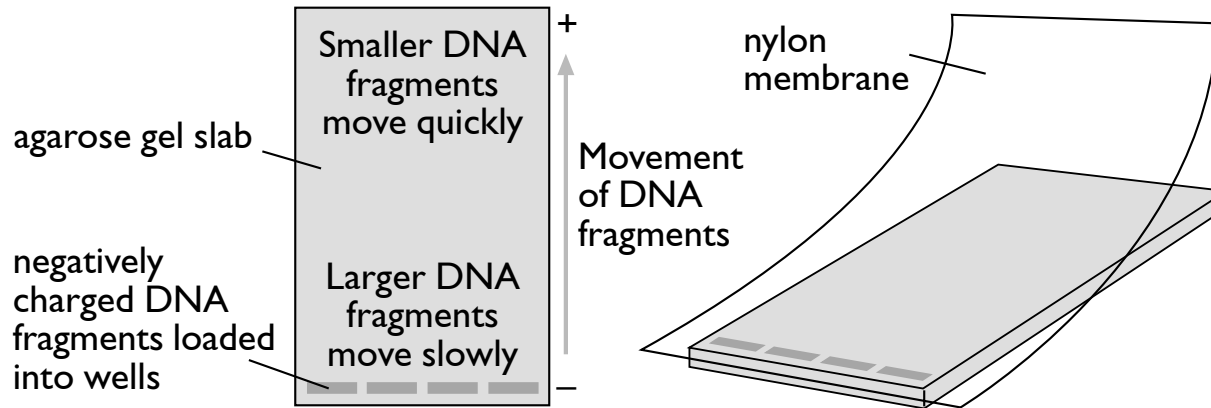
Table of Amino Acid Codons

Amino acid	Abbr.	mRNA codons	Essential
Alanine	Ala	GCA, GCC, GCG, GCU	
Arginine	Arg	AGA, AGG, CGA, CGC, CGG, CGU	infants only
Asparagine	Asn	AAC, AAU	
Aspartic acid	Asp	GAC, GAU	
Cysteine	Cys	UGC, UGU	
Glutamic acid	Glu	GAA, GAG	
Glutamine	Gln	CAA, CAG	
Glycine	Gly	GGA, GGC, GGG, GGU	
Histidine	His	CAC, CAU	infants only
Isoleucine	Ile	AUA, AUC, AUU	E
Leucine	Leu	CUA, CUC, CUG, CUU, UUA, UUG	E
Lysine	Lys	AAA, AAG	E
Methionine	Met	AUG (Start codon)	E
Phenylalanine	Phe	UUC, UUU	E
Proline	Pro	CCA, CCC, CCG, CCU	
Serine	Ser	AGC, AGU, UCA, UCC, UCG, UCU	
Threonine	Thr	ACA, ACC, ACG, ACU	E
Tryptophan	Trp	UGG	E
Tyrosine	Tyr	UAC, UAU	
Valine	Val	GUA, GUC, GUG, GUU	E
STOP CODONS		UAA, UAG, UGA	

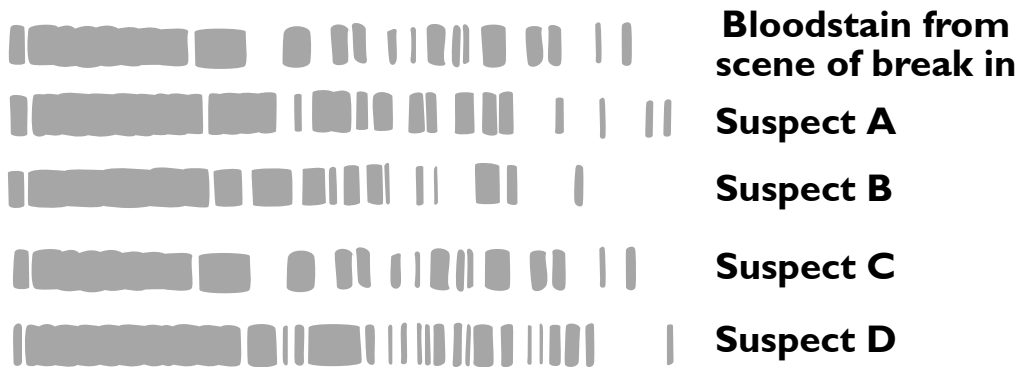
Genetic engineering



- 1 Extracted DNA e.g. from white blood cells, semen etc.
- 2 DNA cut into pieces by **Restriction Enzymes**
- 3 DNA pieces are separated by **Gel Electrophoresis** this takes 24 hours



- 4 **Southern Blotting**, the DNA fragments are transferred (blotted) onto a nylon membrane laid on top of the gel slab.
- 5 **Gene Probe Treatment** - the nylon membrane is put into a tank of single strand DNA's (probes) which are complementary to specific core DNA sequences and bind to them. The probes may be radioactive or fluorescent. Excess probes are washed off
- 6 X Ray film is placed on the membrane and the typical bands appear where the presence of **radioactive/fluorescent probes** fog the film.
- 7 The X Ray film is processed to form the **DNA Fingerprint** with its characteristic 'barcode' pattern of dark bands.



Cystic Fibrosis

Cystic Fibrosis

Mutation causes the deletion of 3 bases in DNA
so that one amino acid (phenylalanine)
is not coded for in the CFTR protein
(Cystic fibrosis transmembrane regulator)



Faulty CFTR protein cannot control the opening of
chloride channels in the cell membrane



Results in production of thick sticky mucus,
especially in lungs, pancreas and liver
Organs cannot function normally
and infection becomes more likely

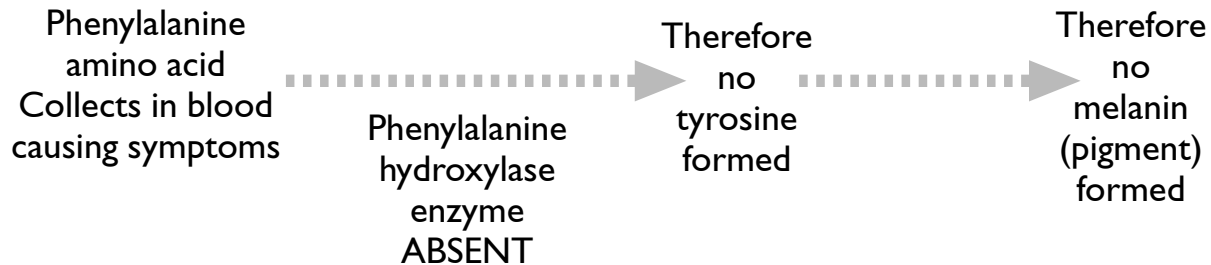
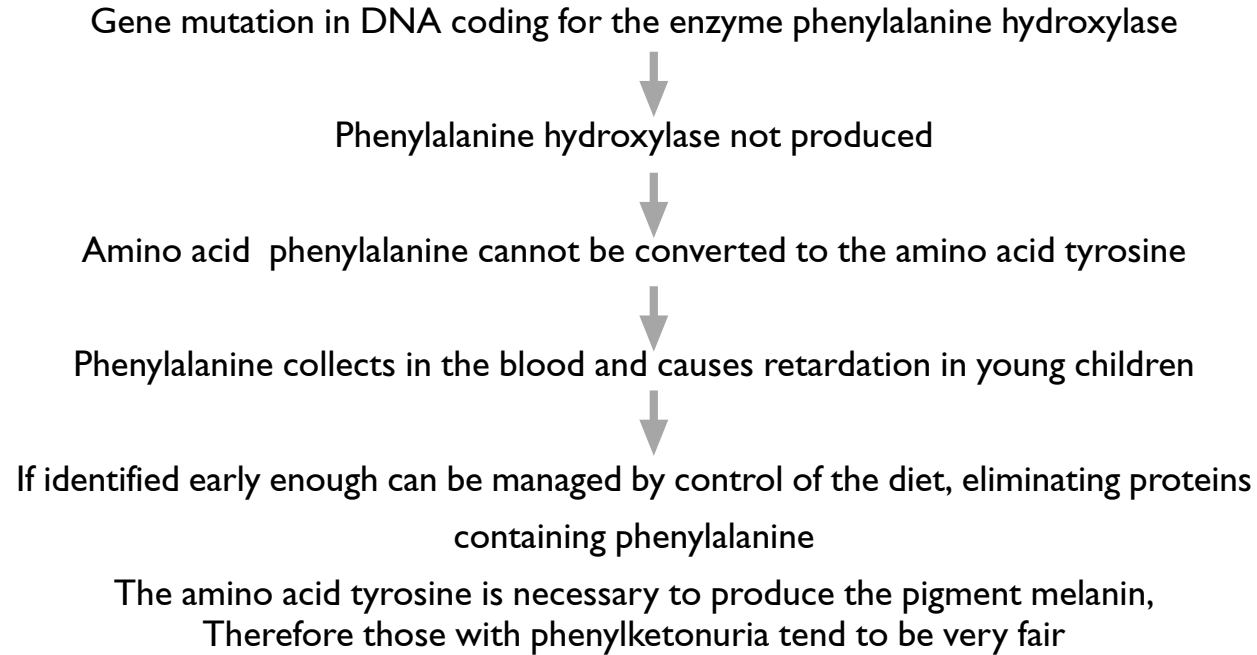
Treatment by Gene Therapy

CFTR gene identified on chromosome 7 in 1989

The normal gene for CFTR protein is inserted into
a bacterial plasmid (DNA).
This is enclosed in a liposome (hollow lipid container)

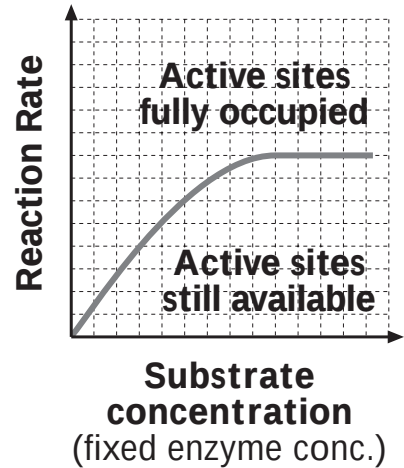
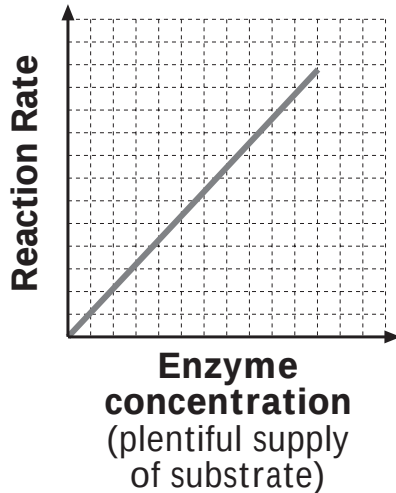
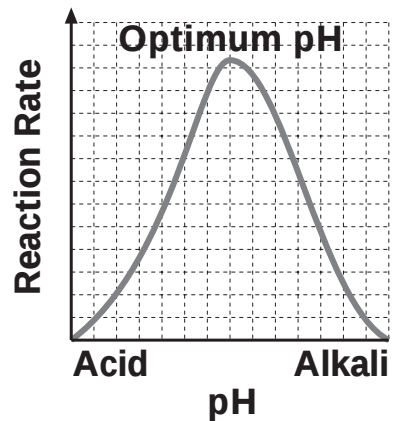
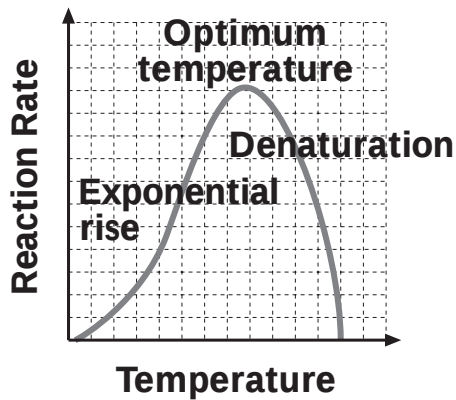
The liposomes are introduced into the body
of the sufferer using a nasal spray

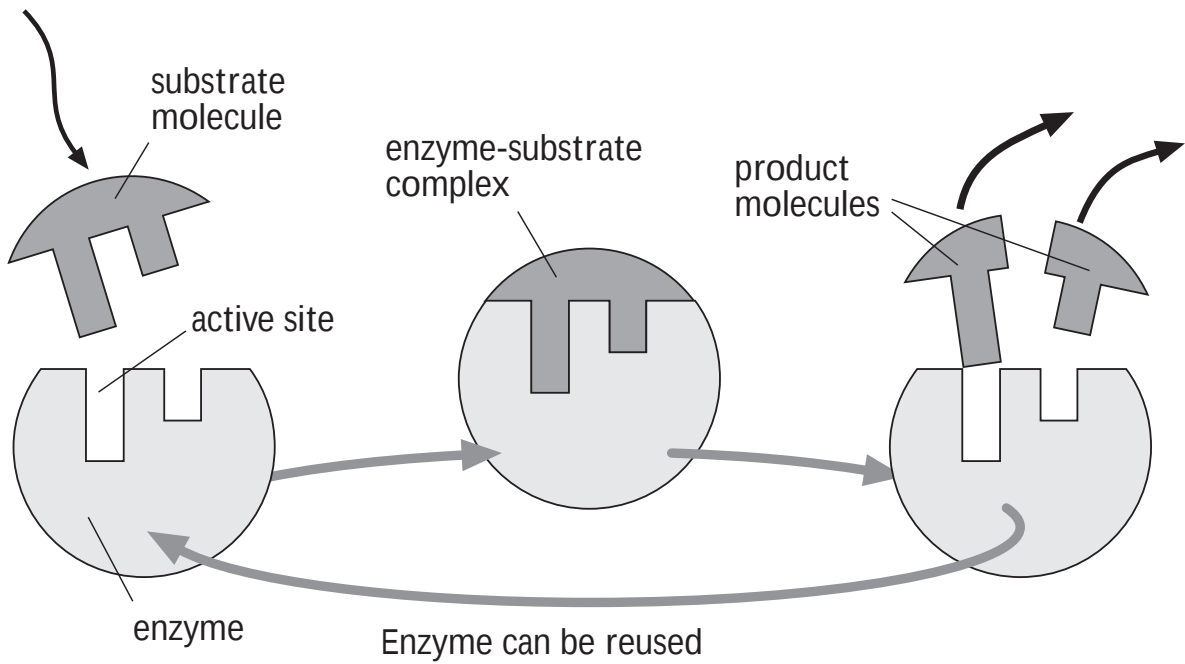
The liposomes reach the lung epithelial cells and
hopefully some of the normal CFTR genes are
incorporated into the cells' DNA.
(The normal gene could also be introduced using a 'safe' virus)

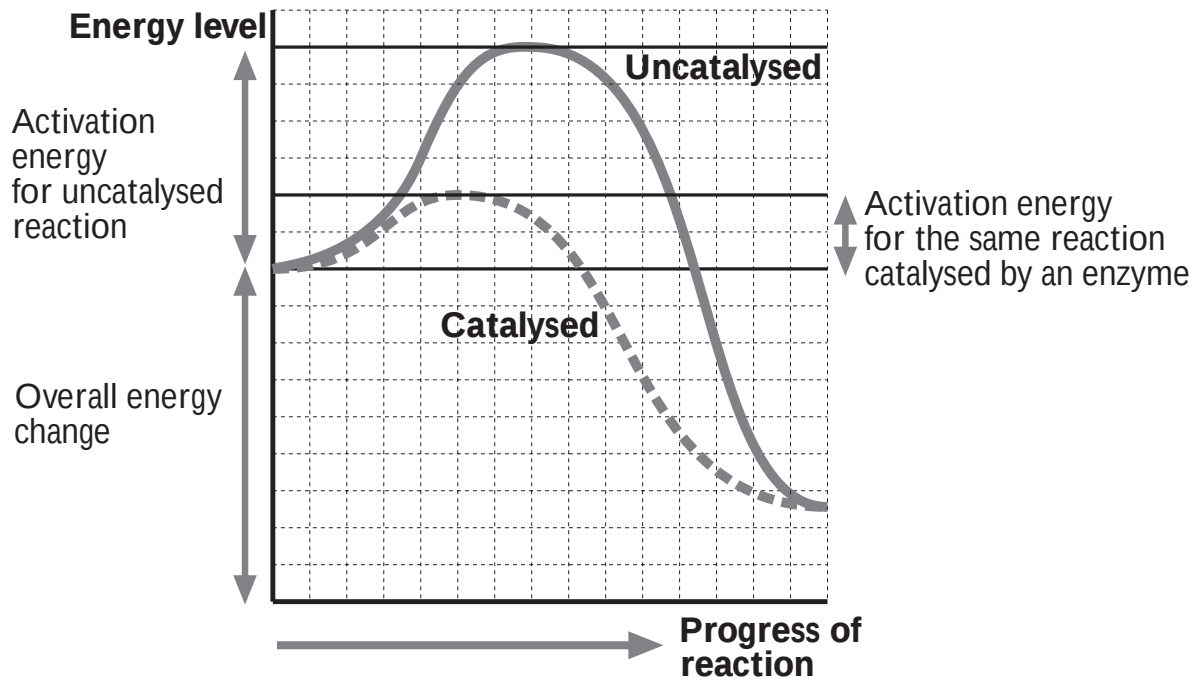


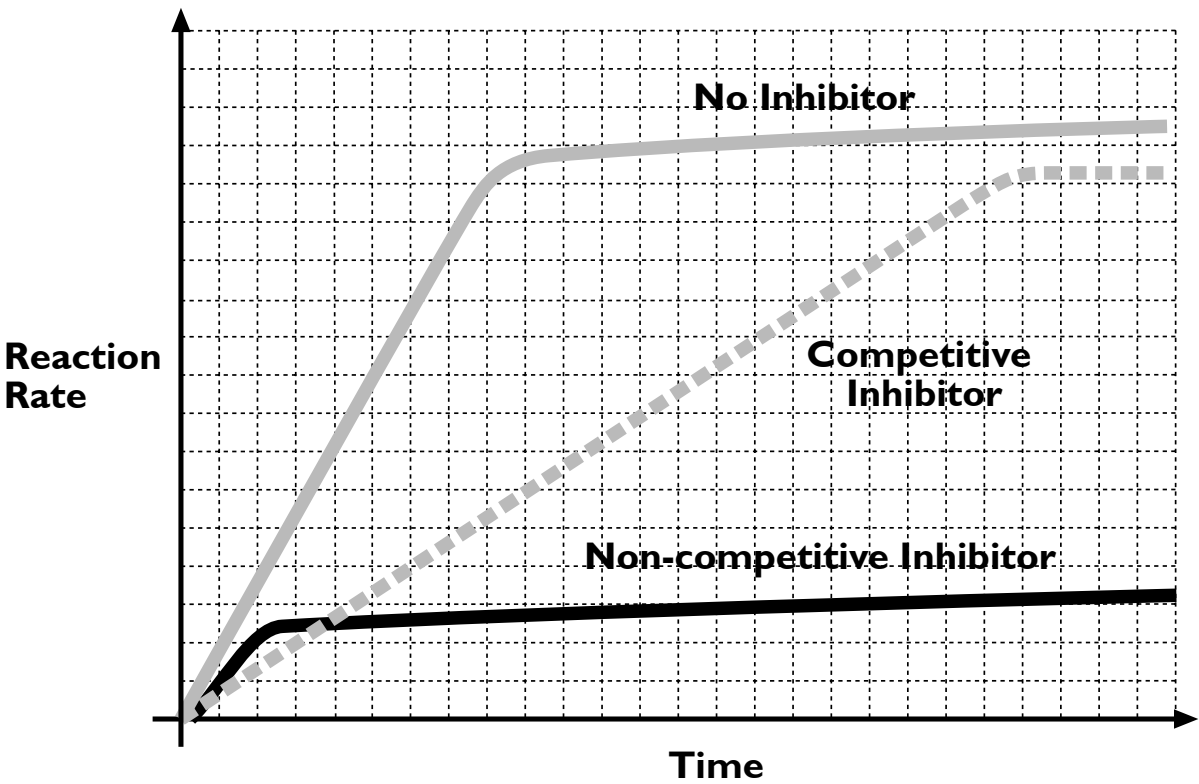
ENZYME CATALYSED REACTIONS

Temperature, pH, enzyme
and substrate concentration



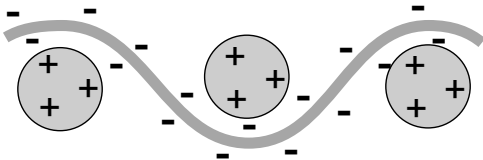




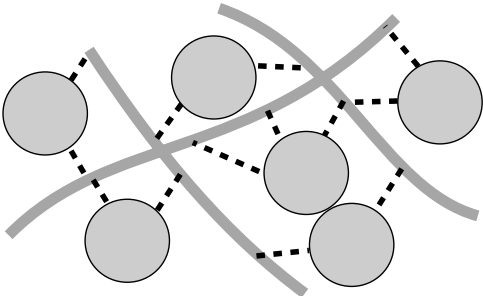


Immobilisation of enzymes

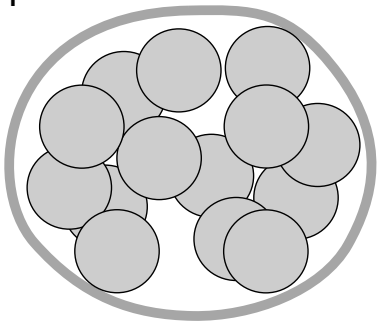
Absorbption



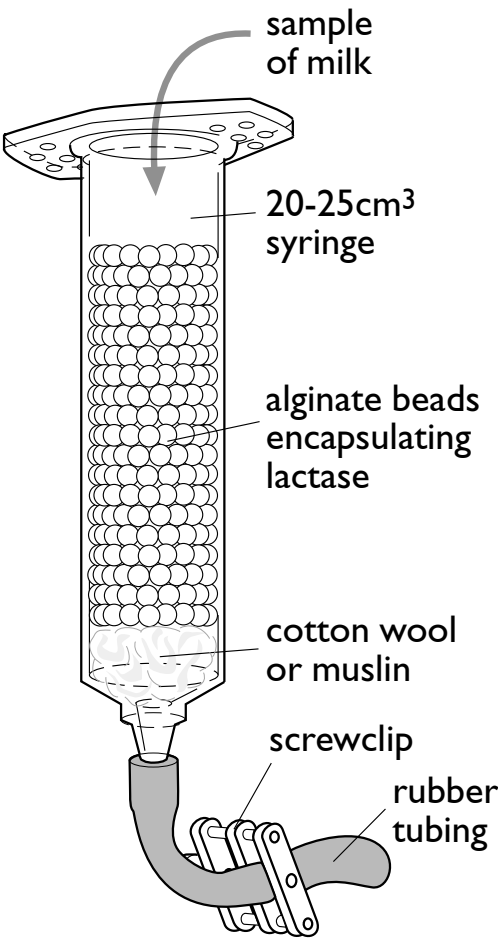
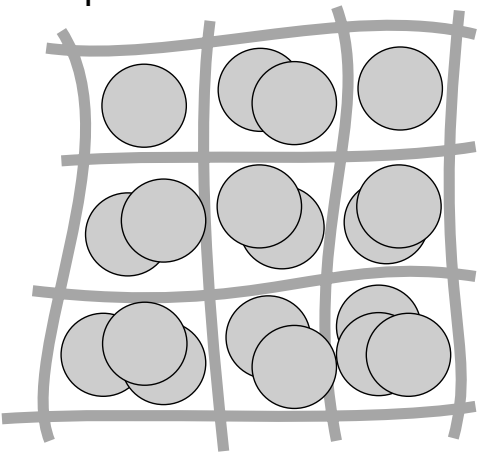
Covalent binding



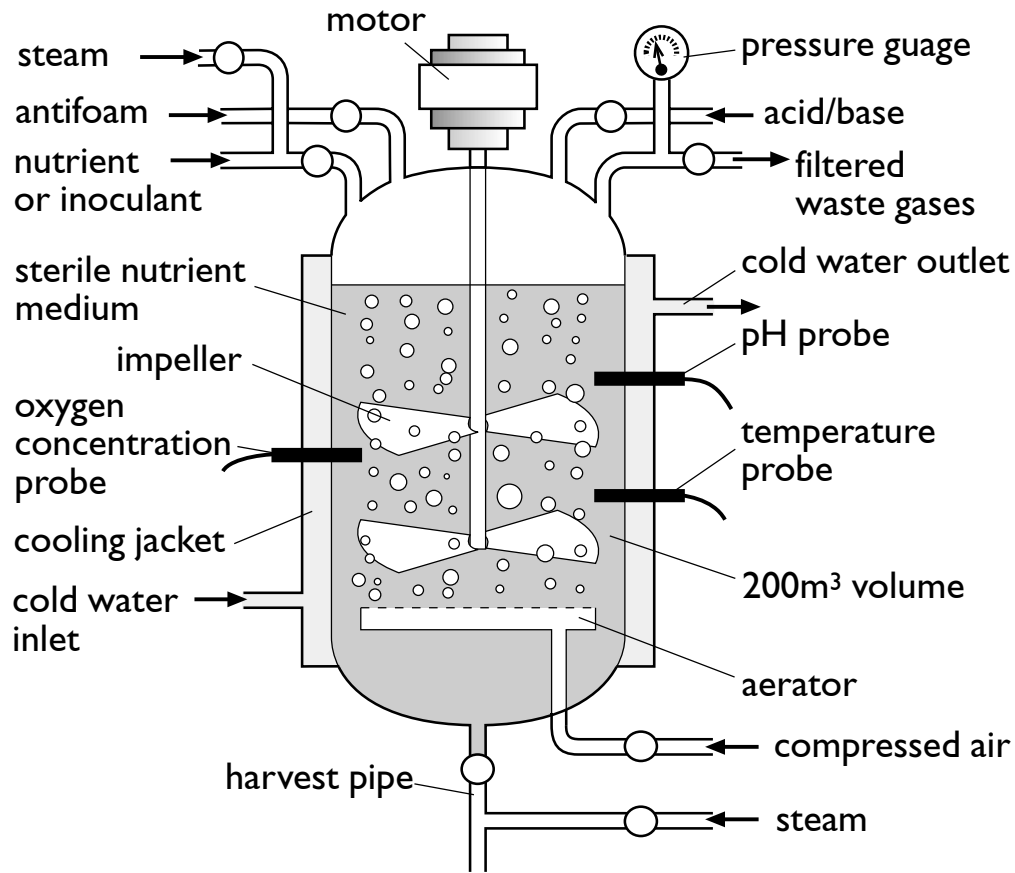
Encapsulation



Entrapment



Fermenter

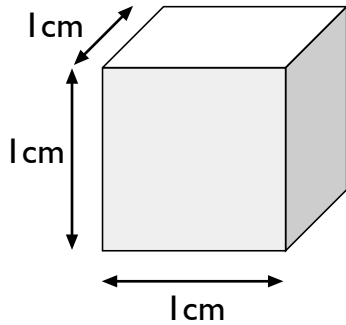


GAS EXCHANGE AND TRANSPORT IN VERTEBRATES

Surface area = 6cm^2

Volume = 1cm^3

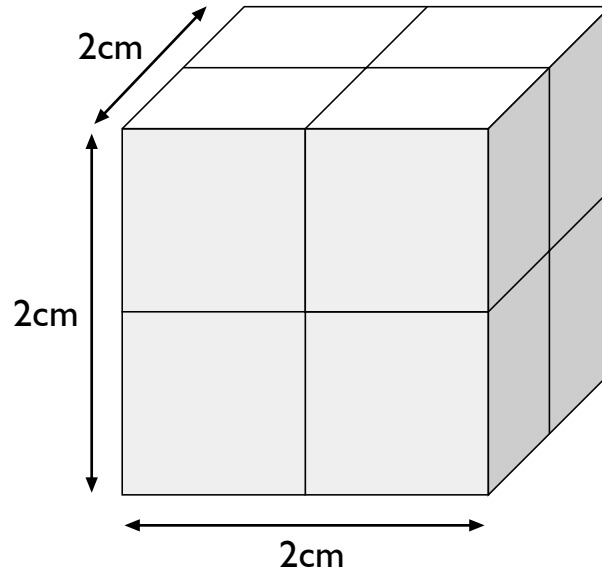
Surface area to volume = $6:1 = 6$



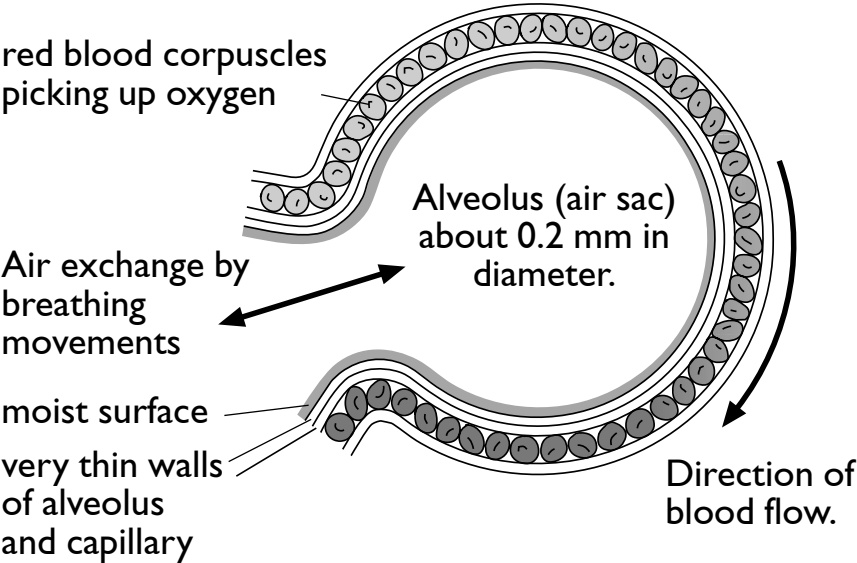
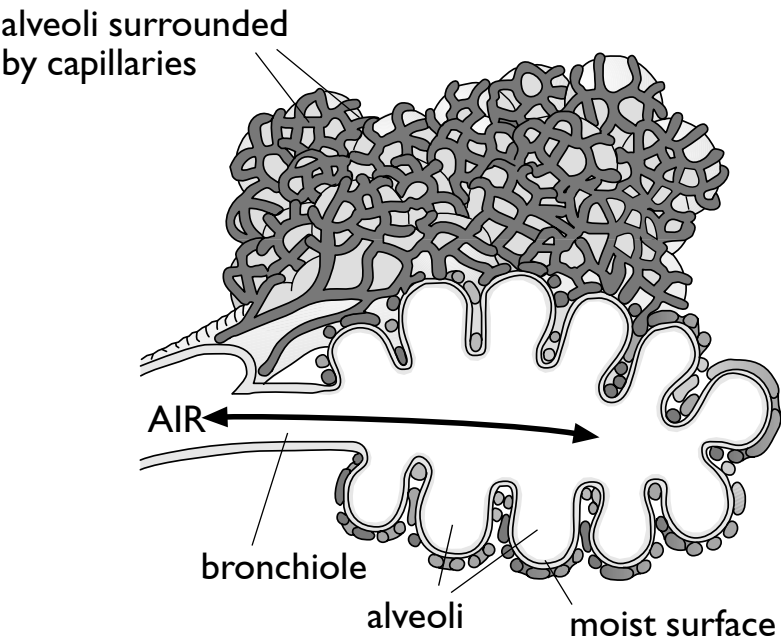
Surface area = 24cm^2

Volume = 8cm^3

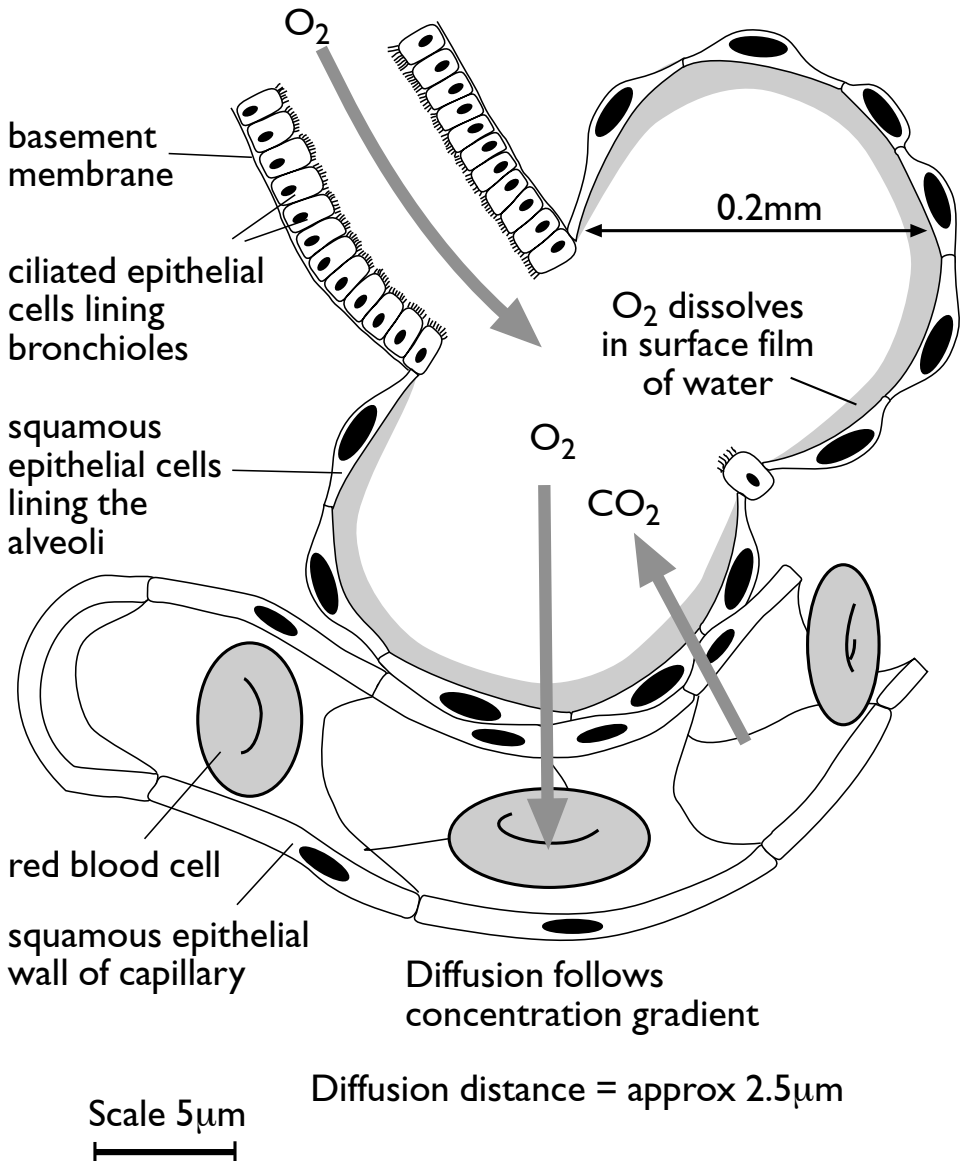
Surface area to volume = $24:8 = 3$

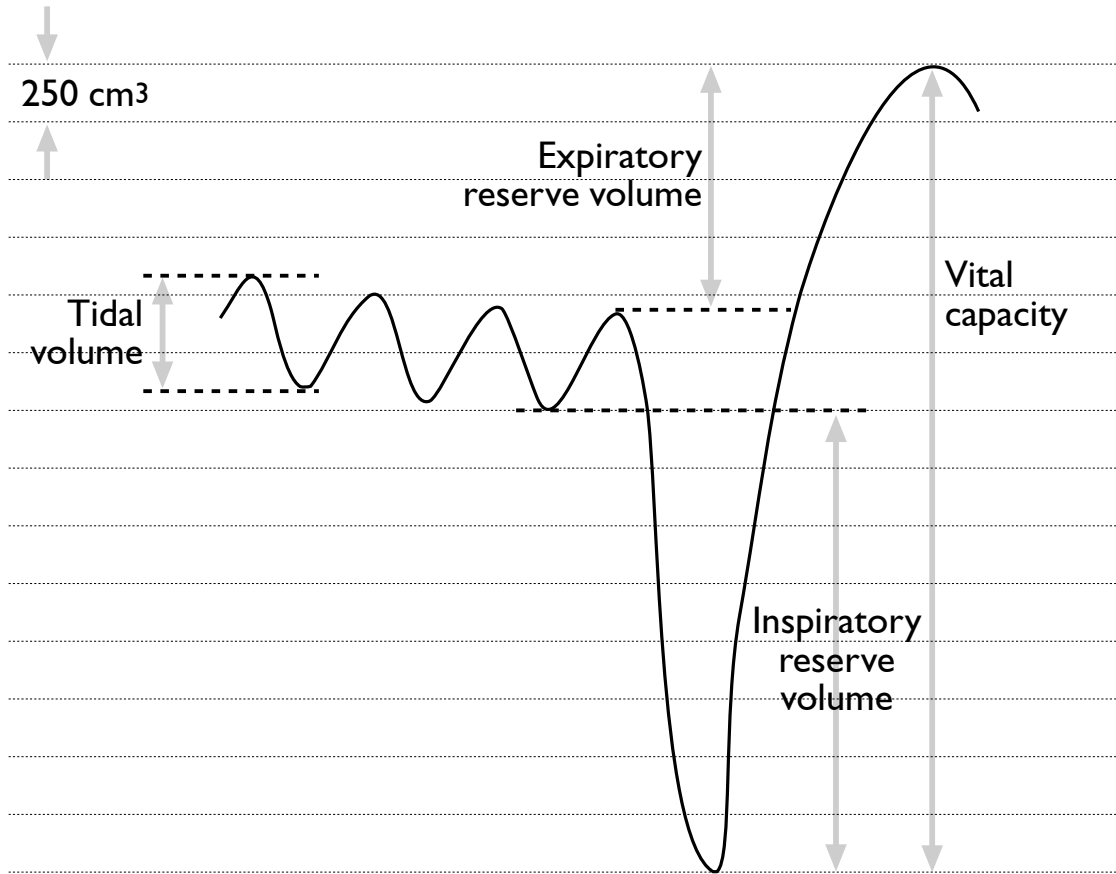


Alveoli and associated capillaries



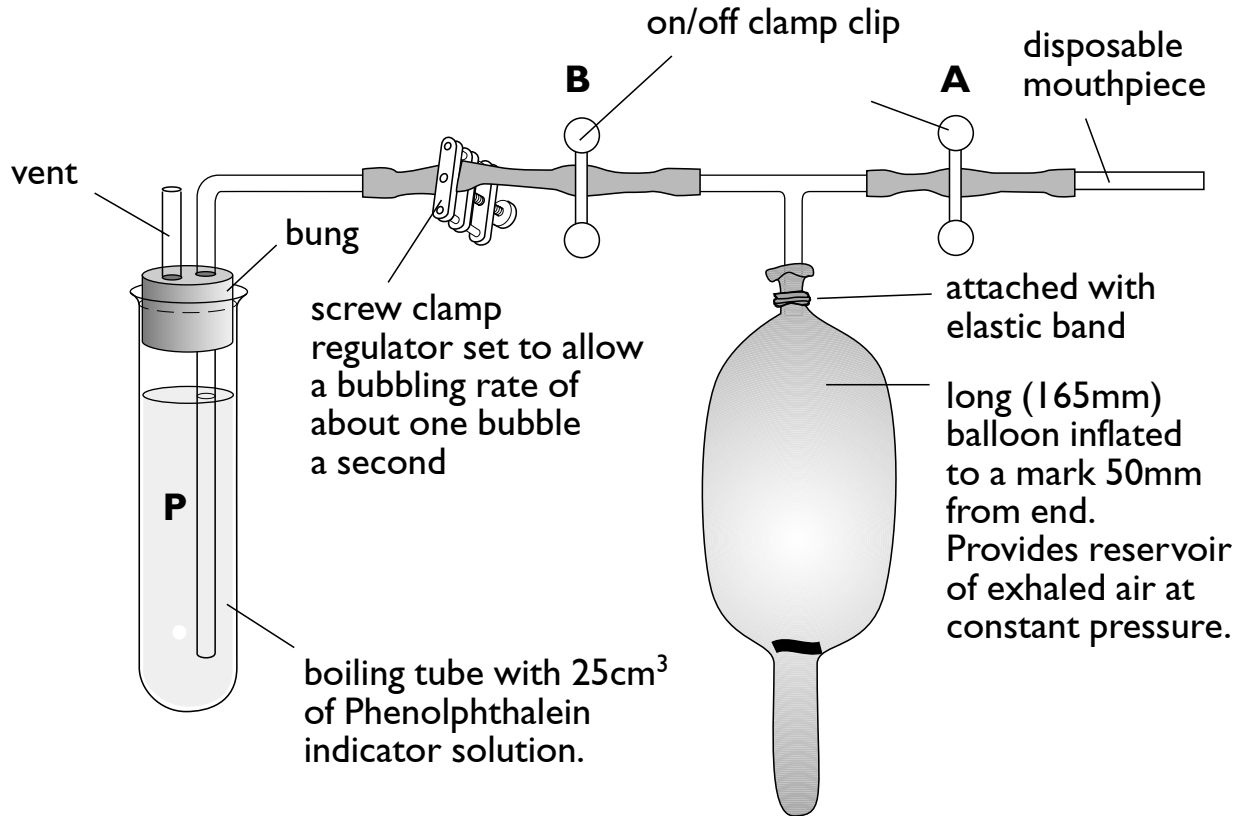
Diffusion at alveolus



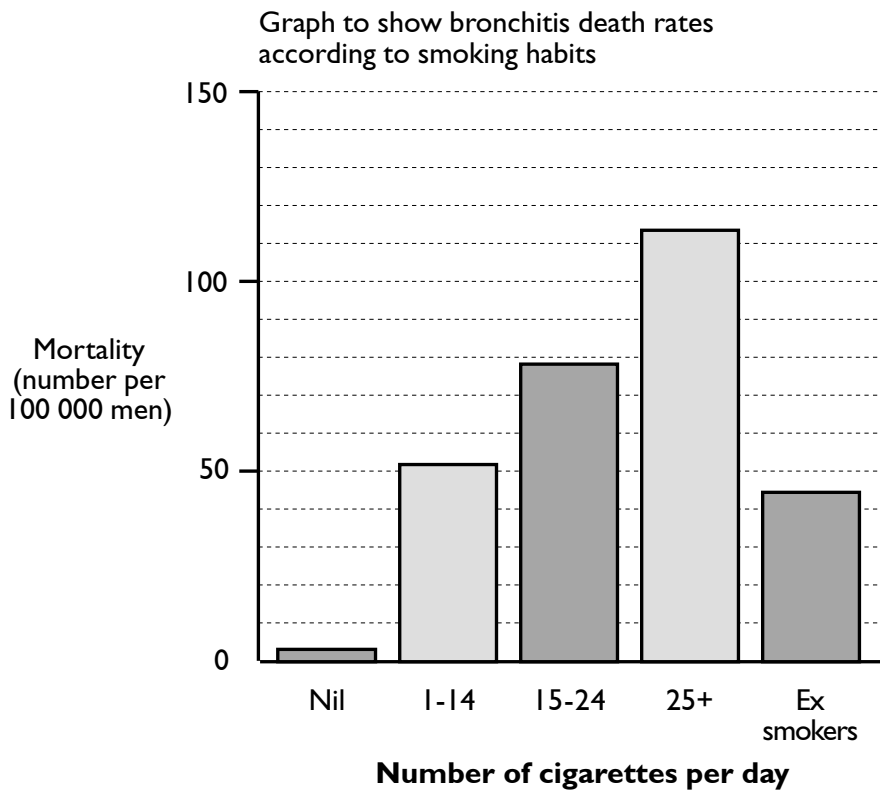


This trace does not show the total lung volume and residual volume, which are not easily measured. With increasing age the residual volume increases from about 20% of the total lung volume to more than 30%.

Simple apparatus for measurement of carbon dioxide levels in expired air



Risk of bronchitis with smoking



Mammalian heart

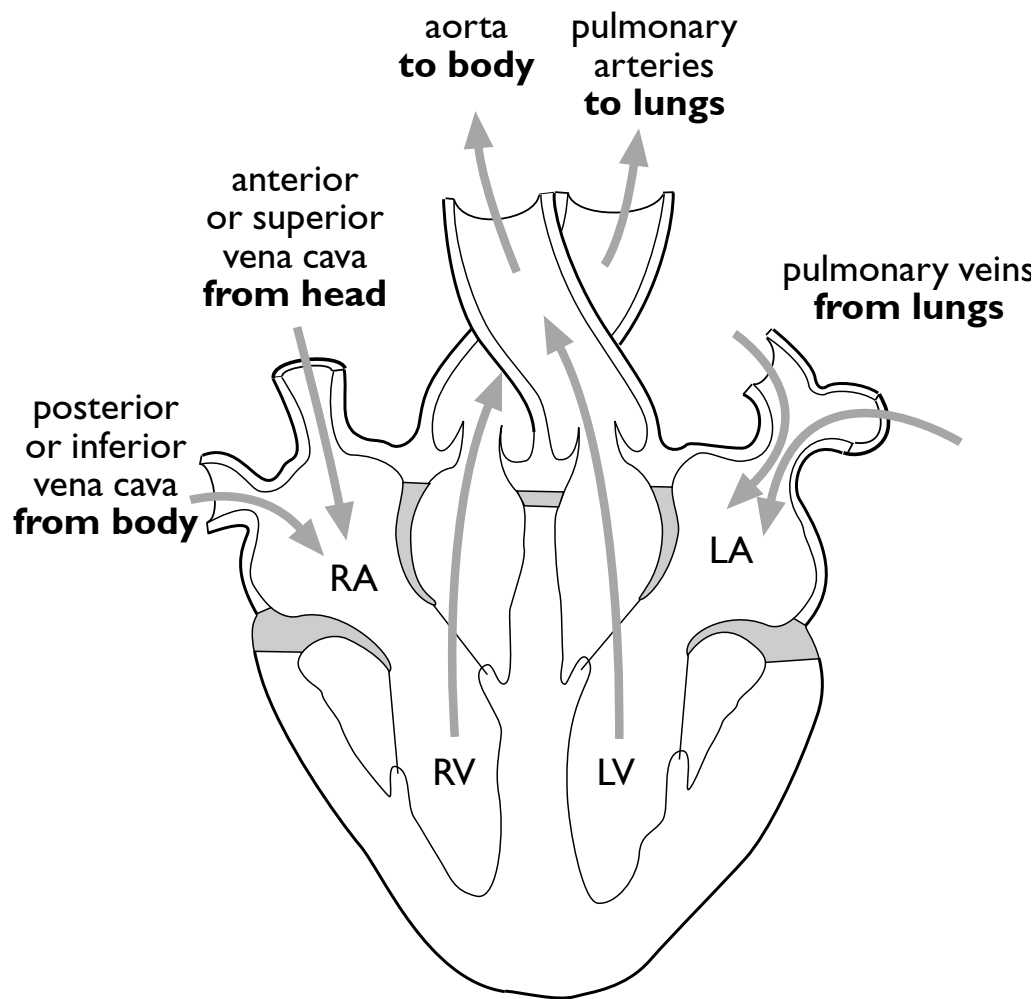


Diagram of heart structure

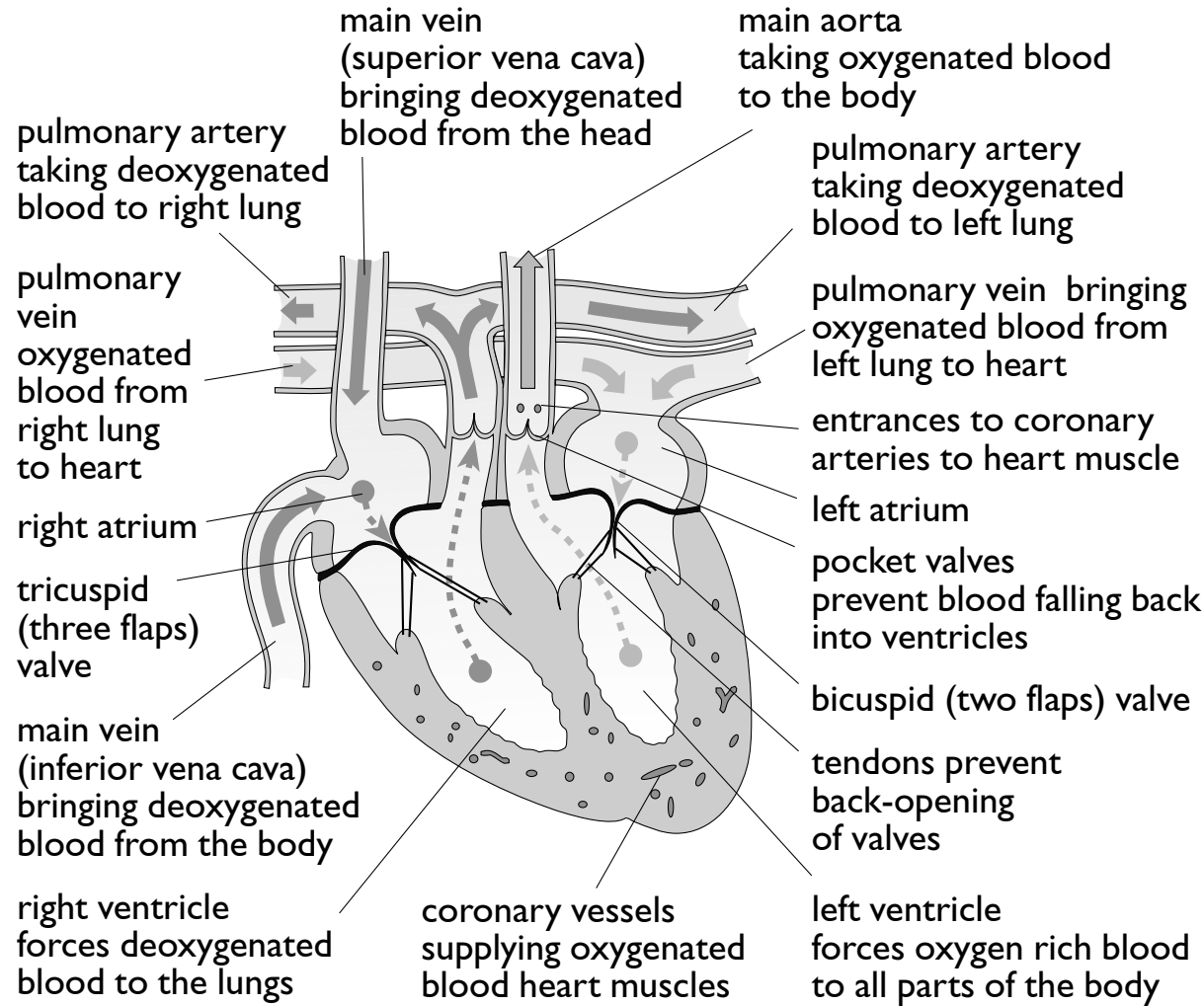
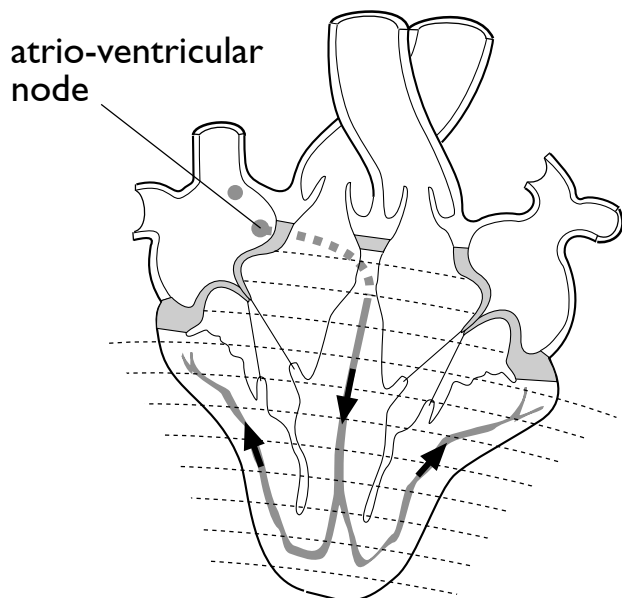
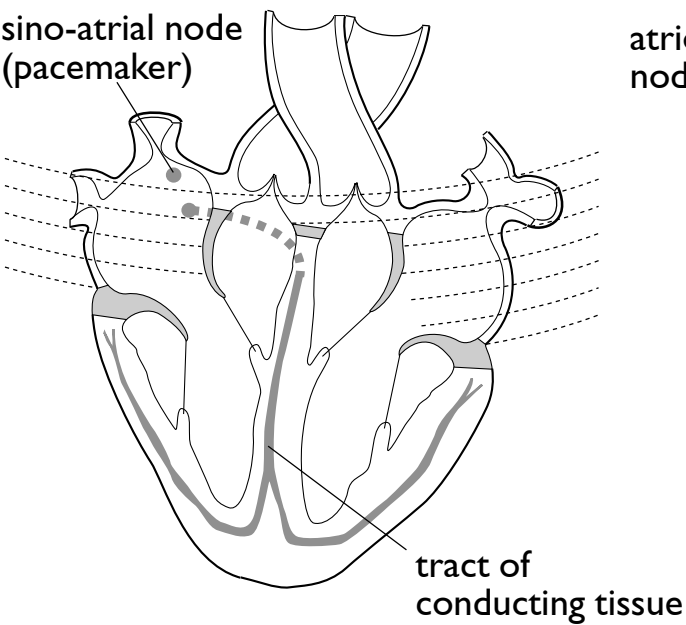
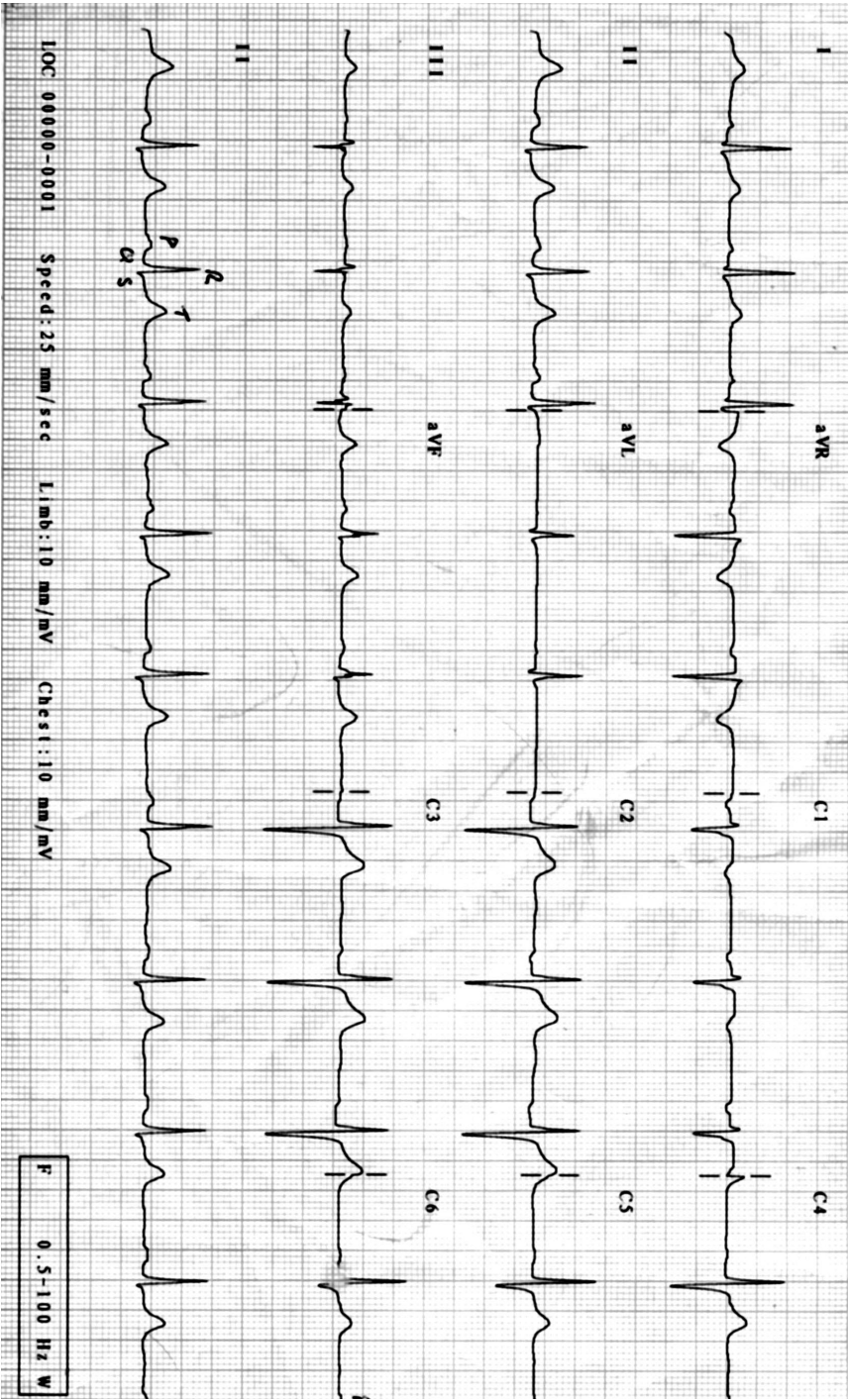


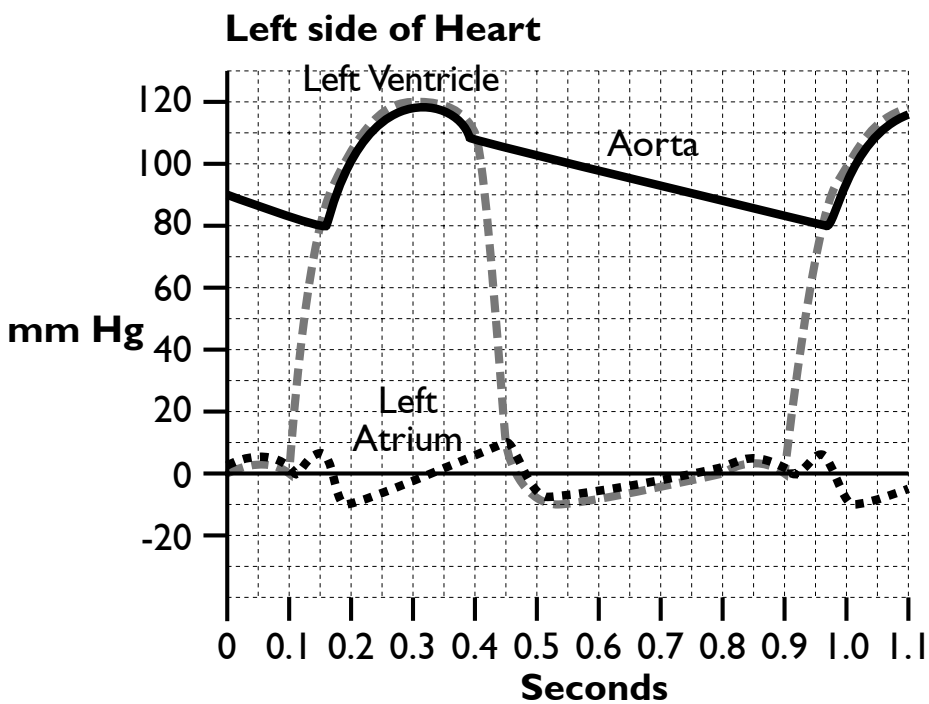
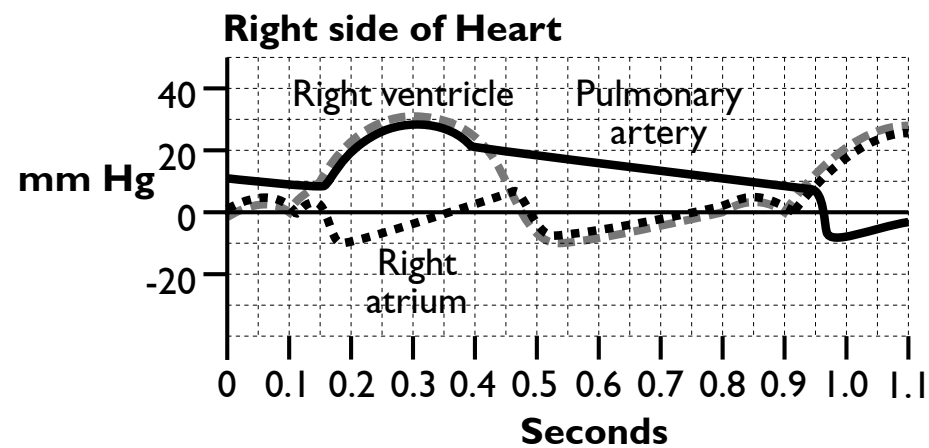
Diagram of heart and SA node

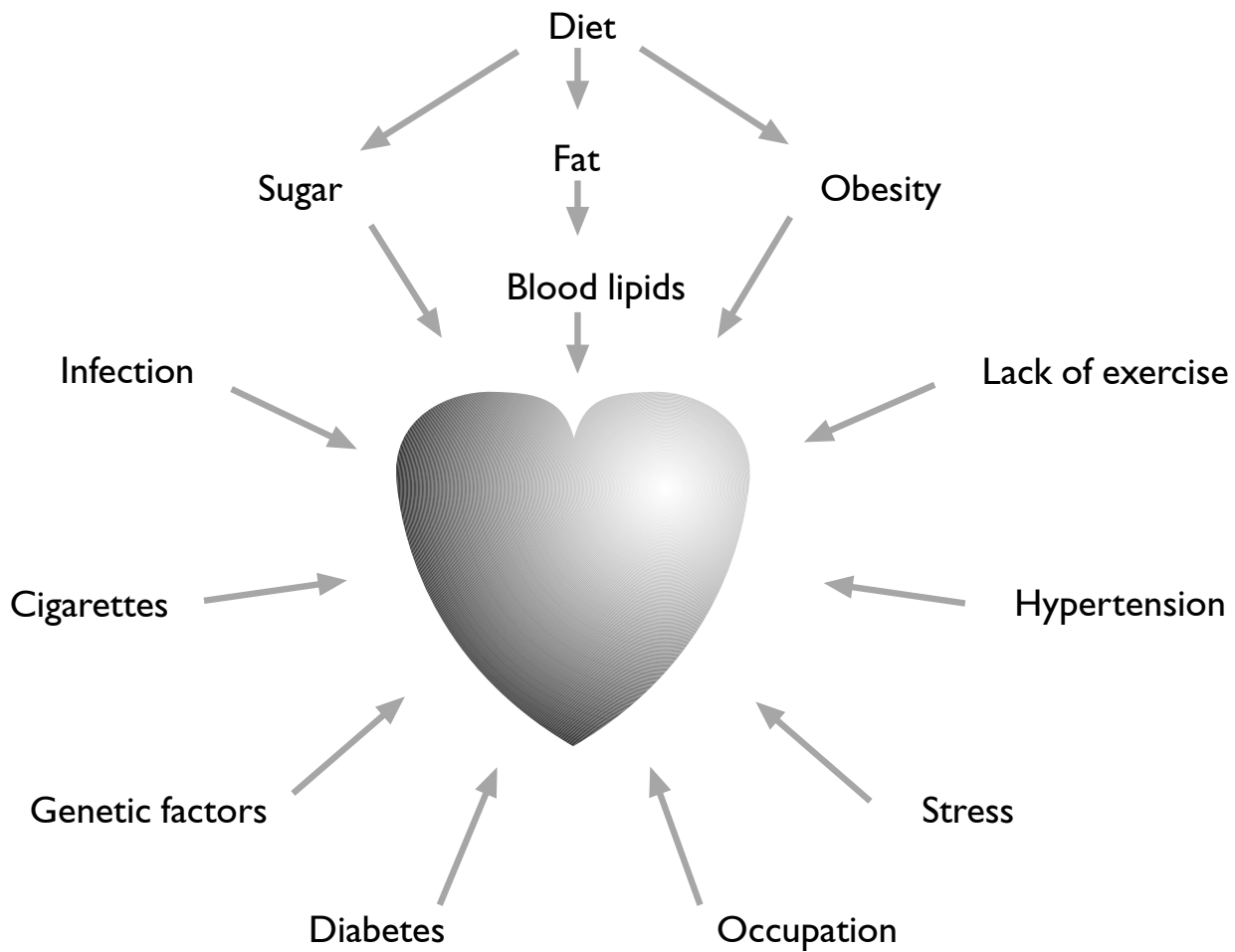


ECG trace



Graph/chart of pressure changes during the cardiac cycle

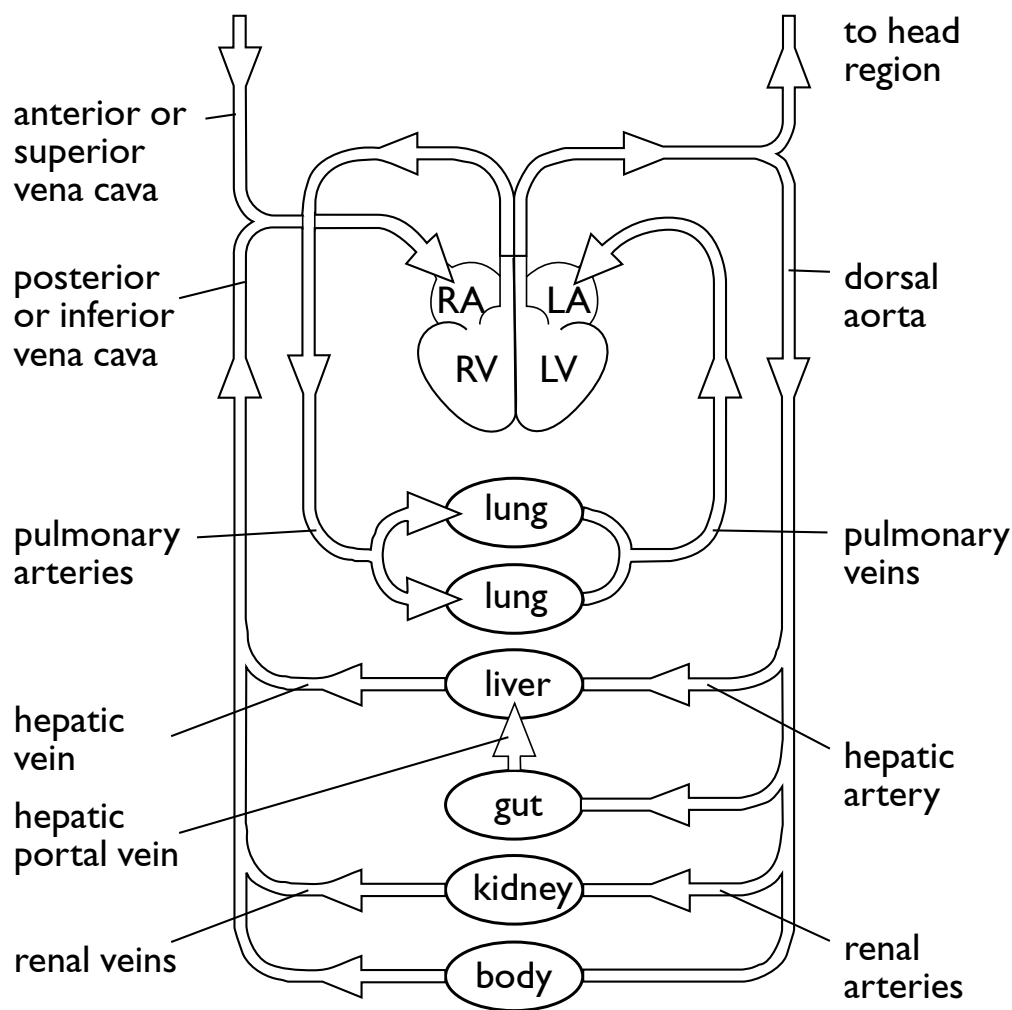




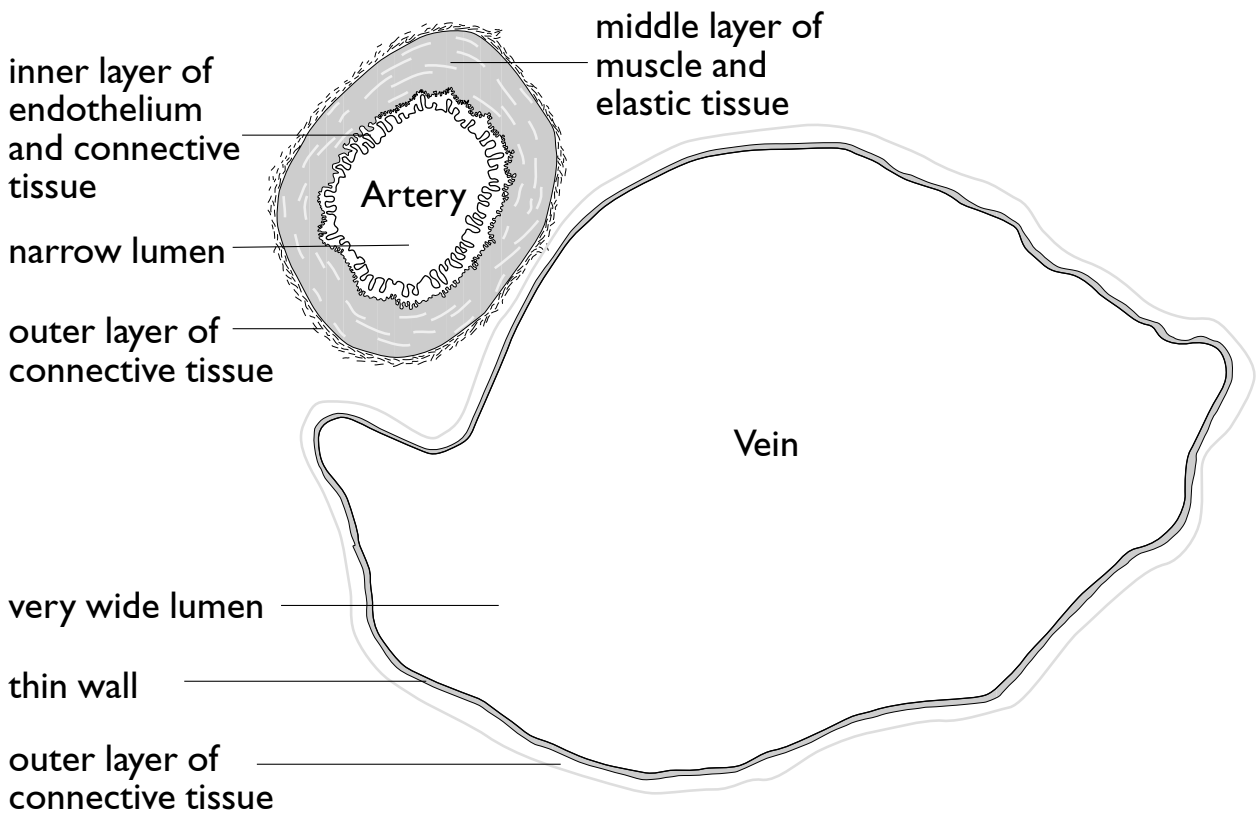
Risk factors in heart disease chart

Age	Sex	Weight	% Animal Fat in Diet	
10-20	Female under 40	More than 2kg below ideal	No animal fat	
21-30	Female under 40-50	Within 2kg of ideal	10% animal fat	
31-40	Female under over 50	15kg over ideal	20% animal fat	
41-50	Male	20kg over ideal	30% animal fat	
51-60	Stocky male	25kg over ideal	40% animal fat	
61 & over	Bald stocky male	30kg over ideal	50% animal fat	Total 1
+				=
Exercise	Tobacco smoking	History of heart disease	Blood pressure	+
Hard manual job & exercise	Non smoker	None	Upper reading 100	↓
Manual job & medium exercise	Cigar or pipe smoker	1 relative over 60	Upper reading 120	
Office job & hard exercise	10 cigs. aday or less	2 relatives over 60	Upper reading 140	
Office job & medium exercise	20 cigarettes aday	1 relative under 60	Upper reading 160	
Office job & light exercise	30 cigarettes aday	2 relatives under 60	Upper reading 180	
No exercise	40 cigarettes aday	3 relatives under 60	Upper reading 200 or more	Total 2
+				=
The higher the total the higher the risk of CHD			Grand Total = _____	

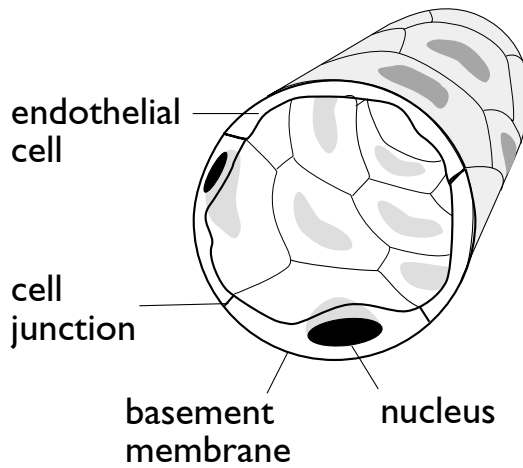
Closed double circulation diagram



Structure of arteries veins as seen under light microscope



Structure of a typical Capillary



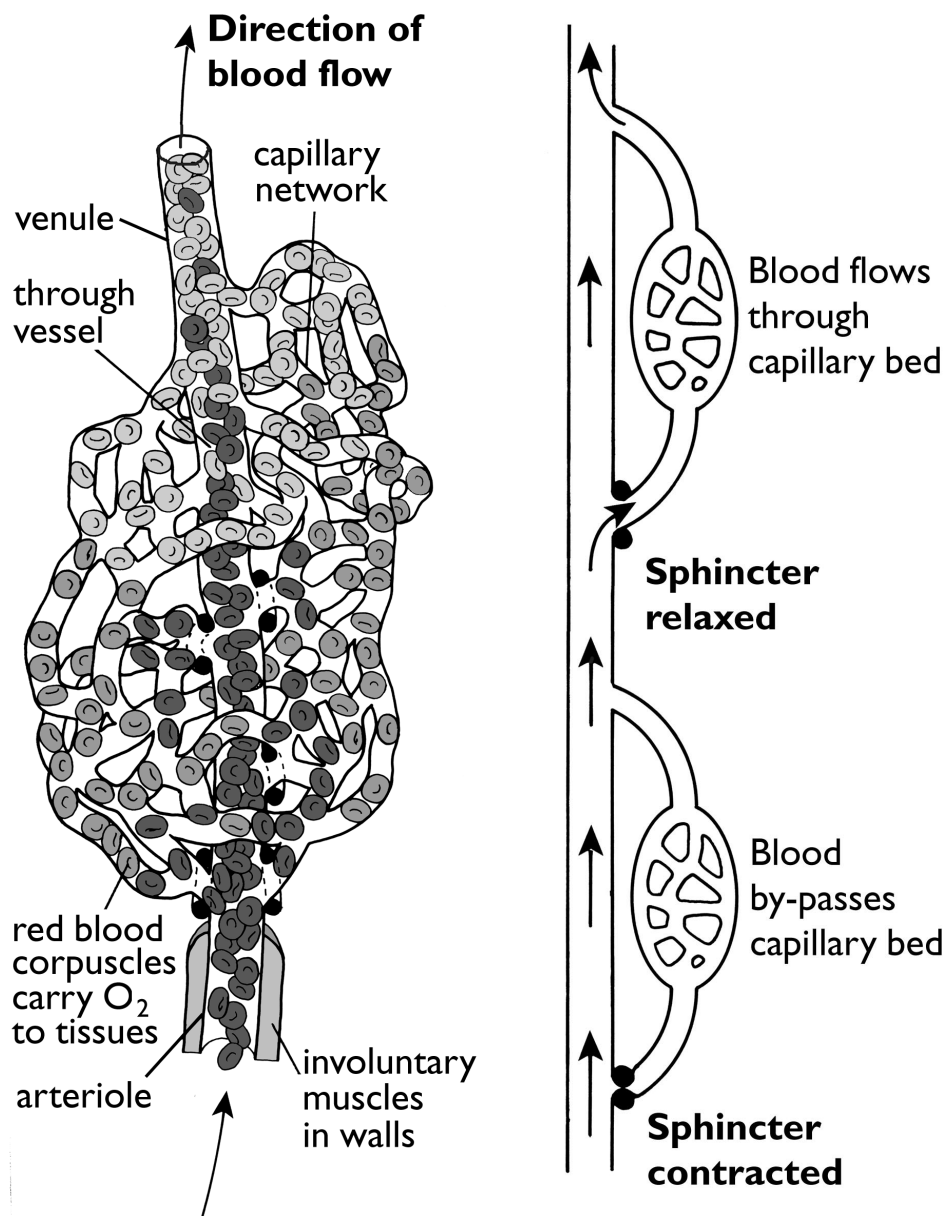
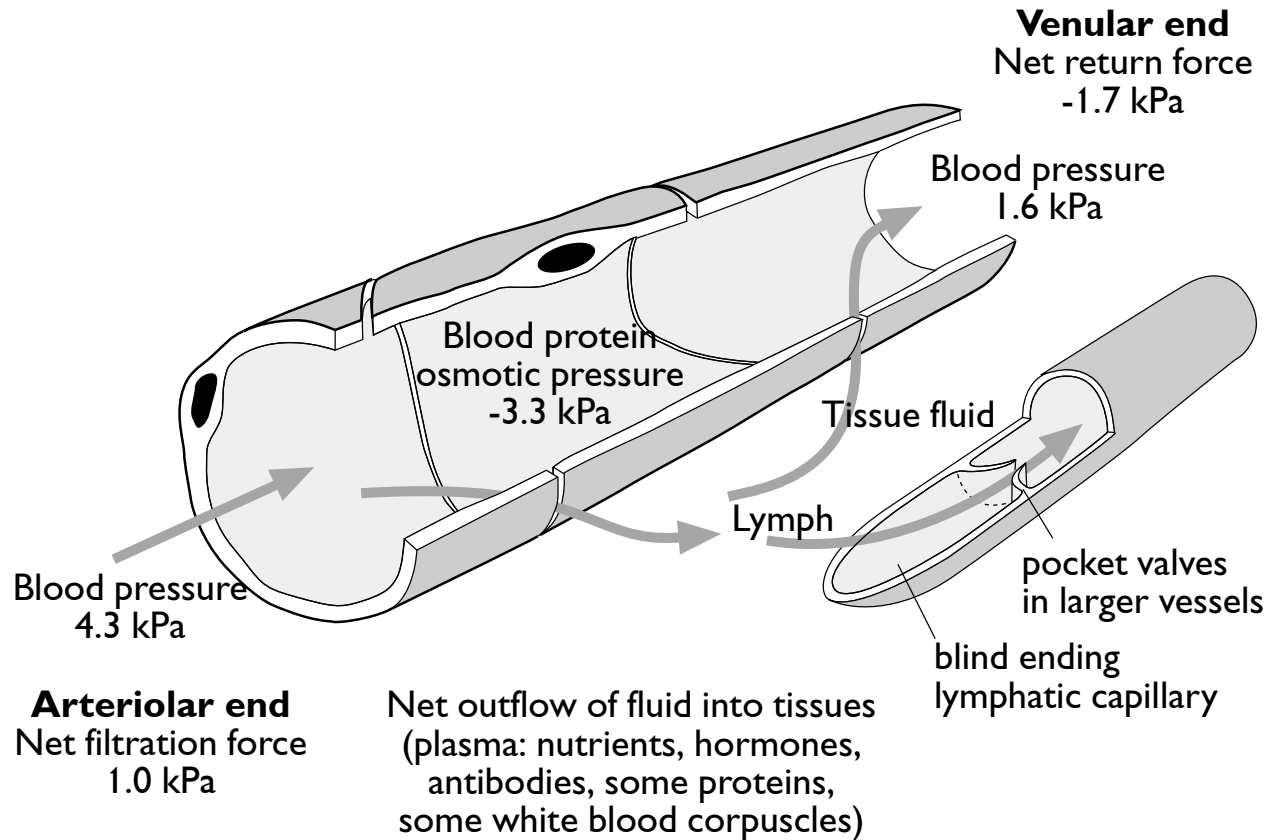
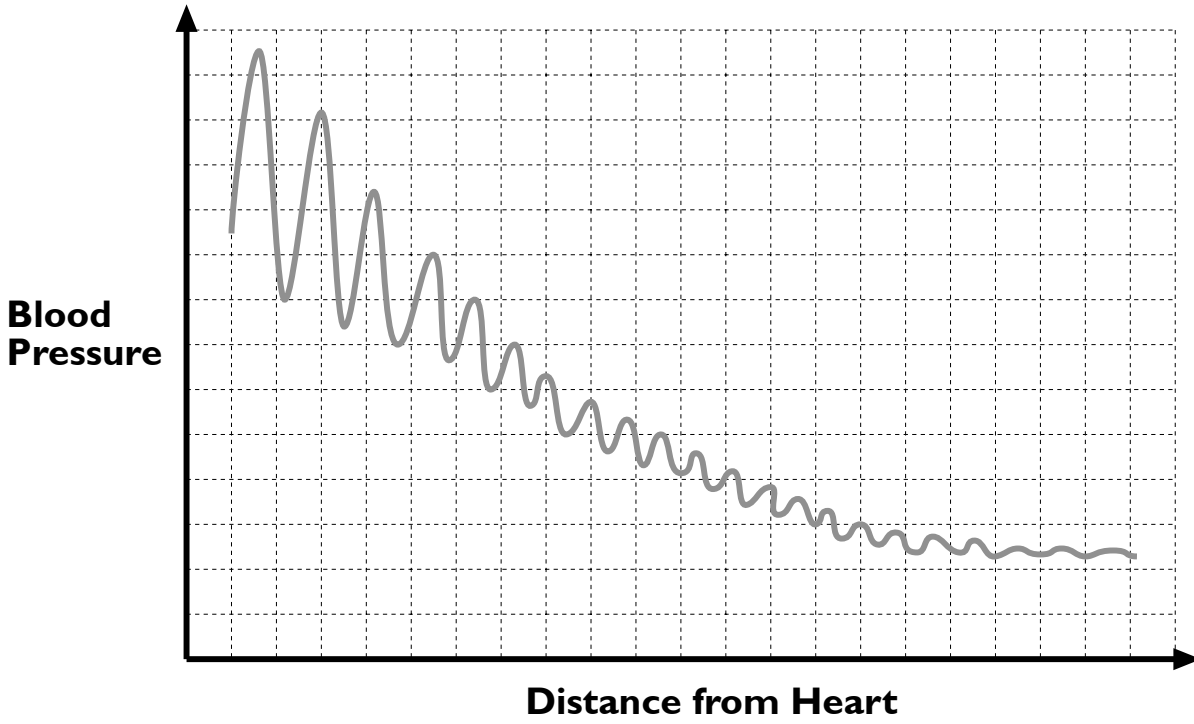


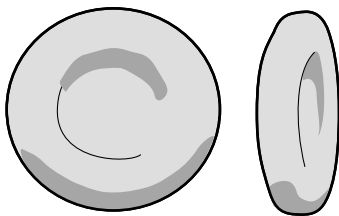
Diagram showing relationship between blood and lymph



Blood pressure with distance from heart



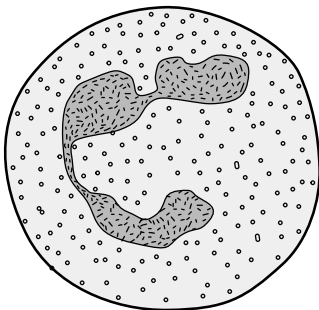
Blood components



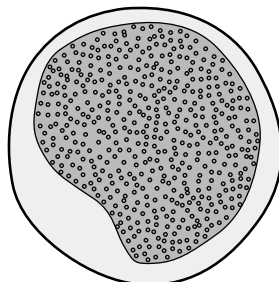
Red cell



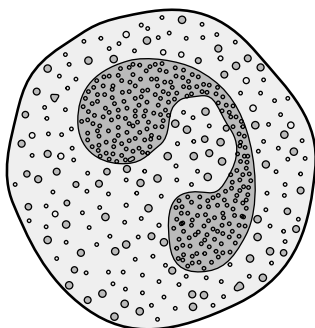
Platelets



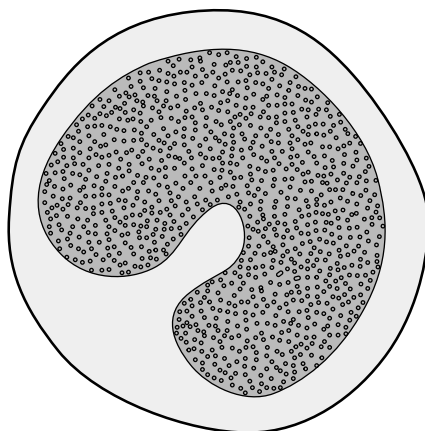
Neutrophil



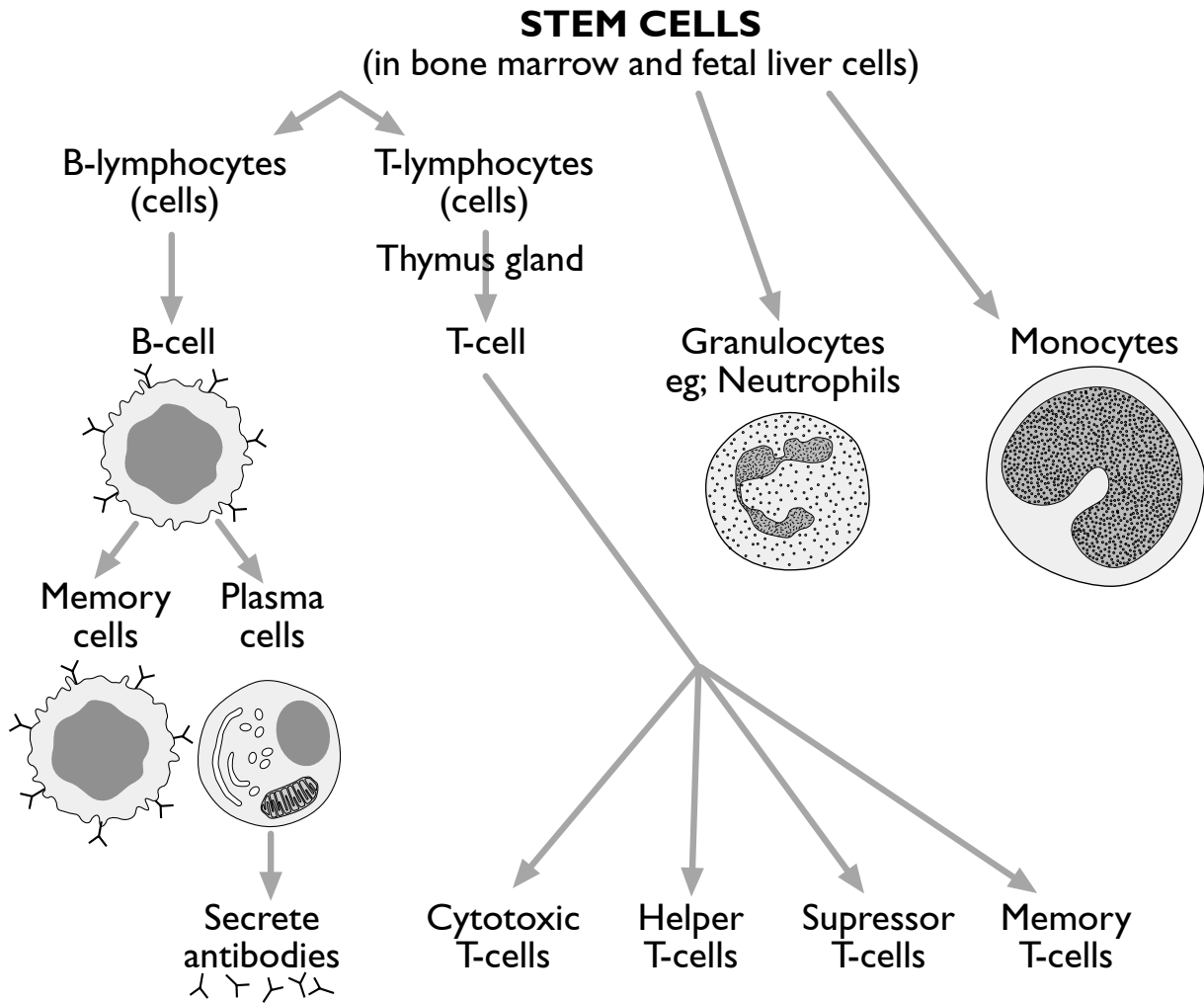
Lymphocyte



Eosinophil



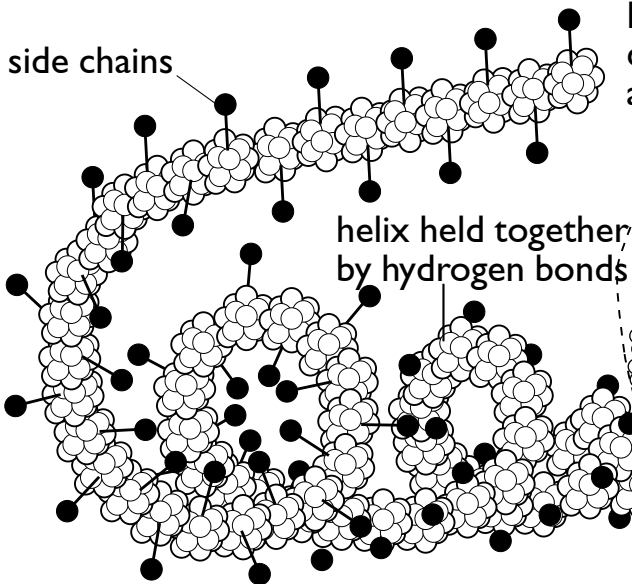
Monocyte



Structure of haemoglobin

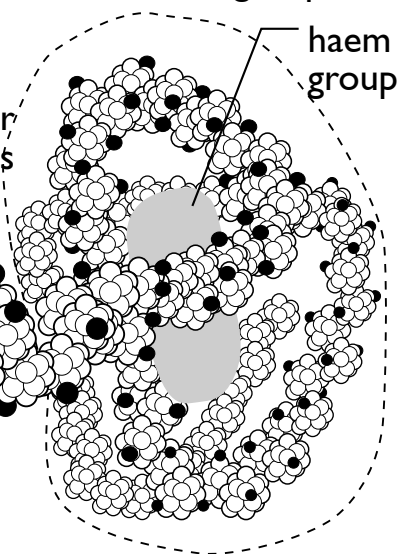
Primary structure

Amino acids join to form a polypeptide chain



Tertiary structure

Helix folds to form compact globular unit around Haem group



Secondary structure

Polypeptide chain folds in upon itself to form a helix

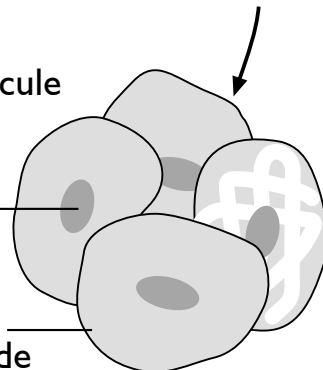
Haemoglobin molecule has four subunits

Quaternary structure

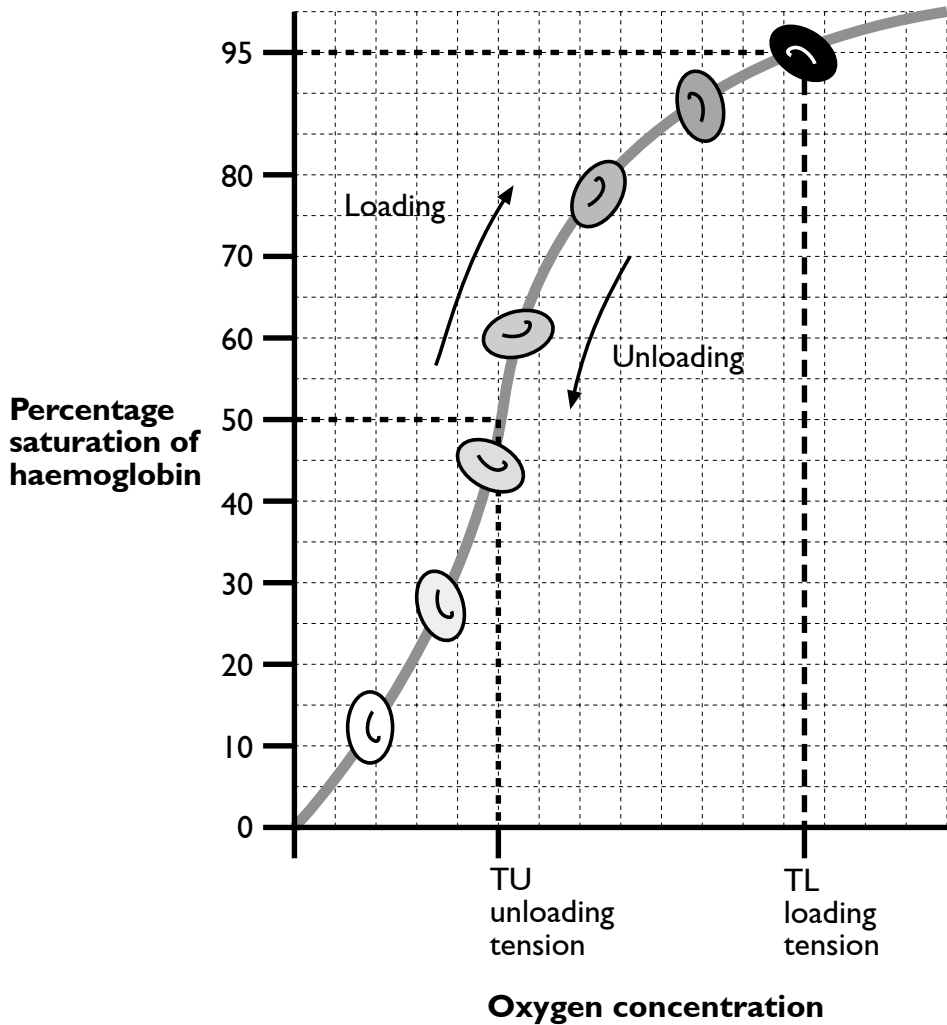
Several polypeptide chain units come together held by disulphide bridges to form a functional protein

haem group

globular polypeptide subunit

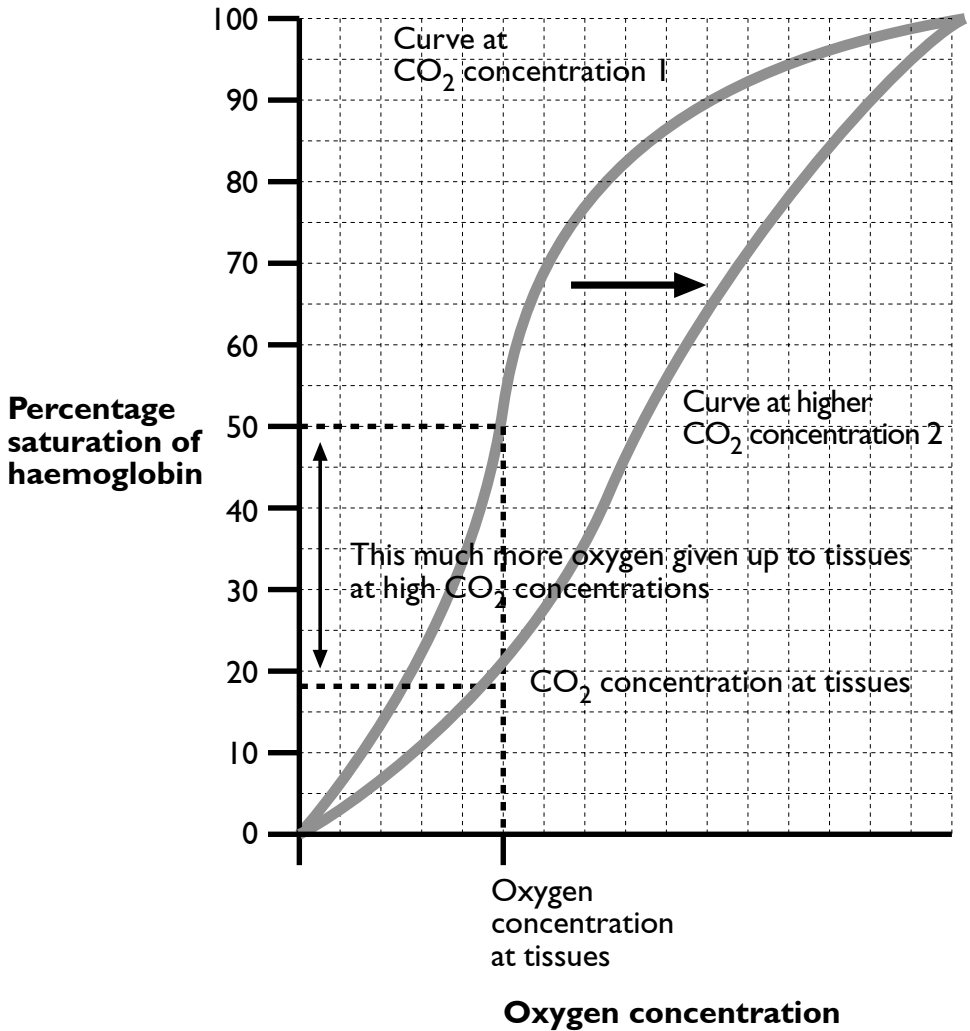


Normal dissociation curve

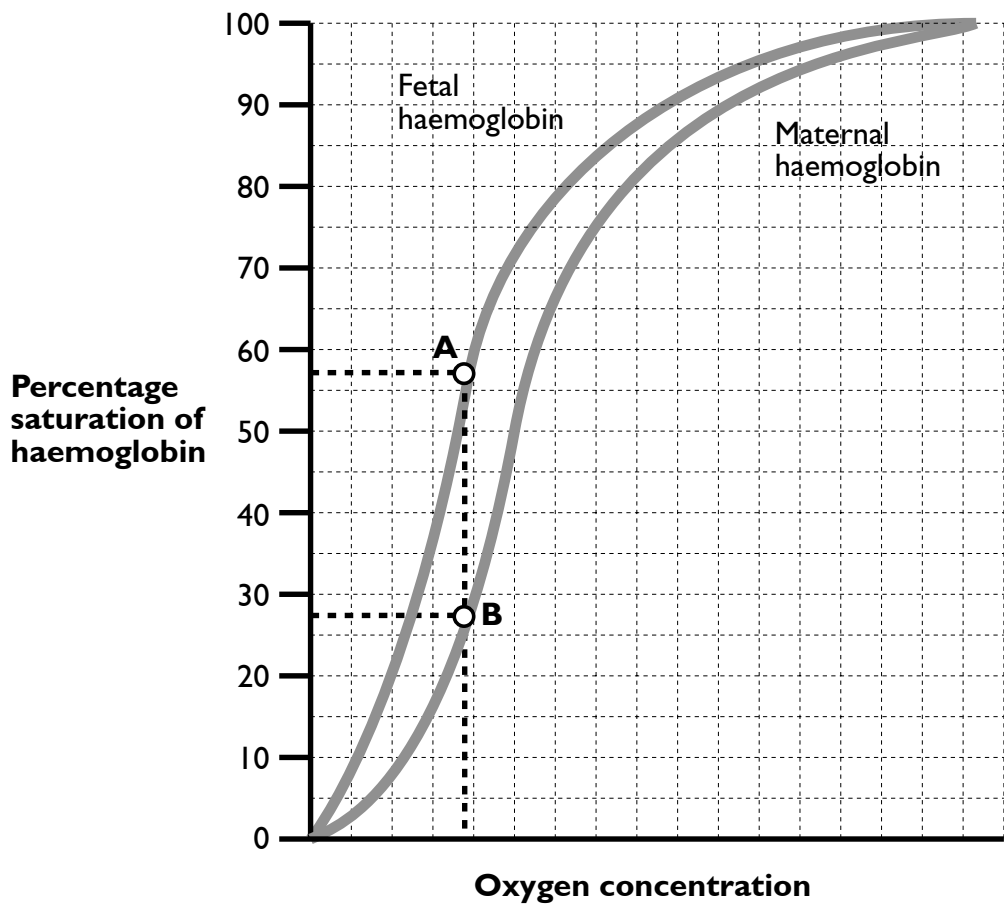


This basic type of curve is altered with differing conditions

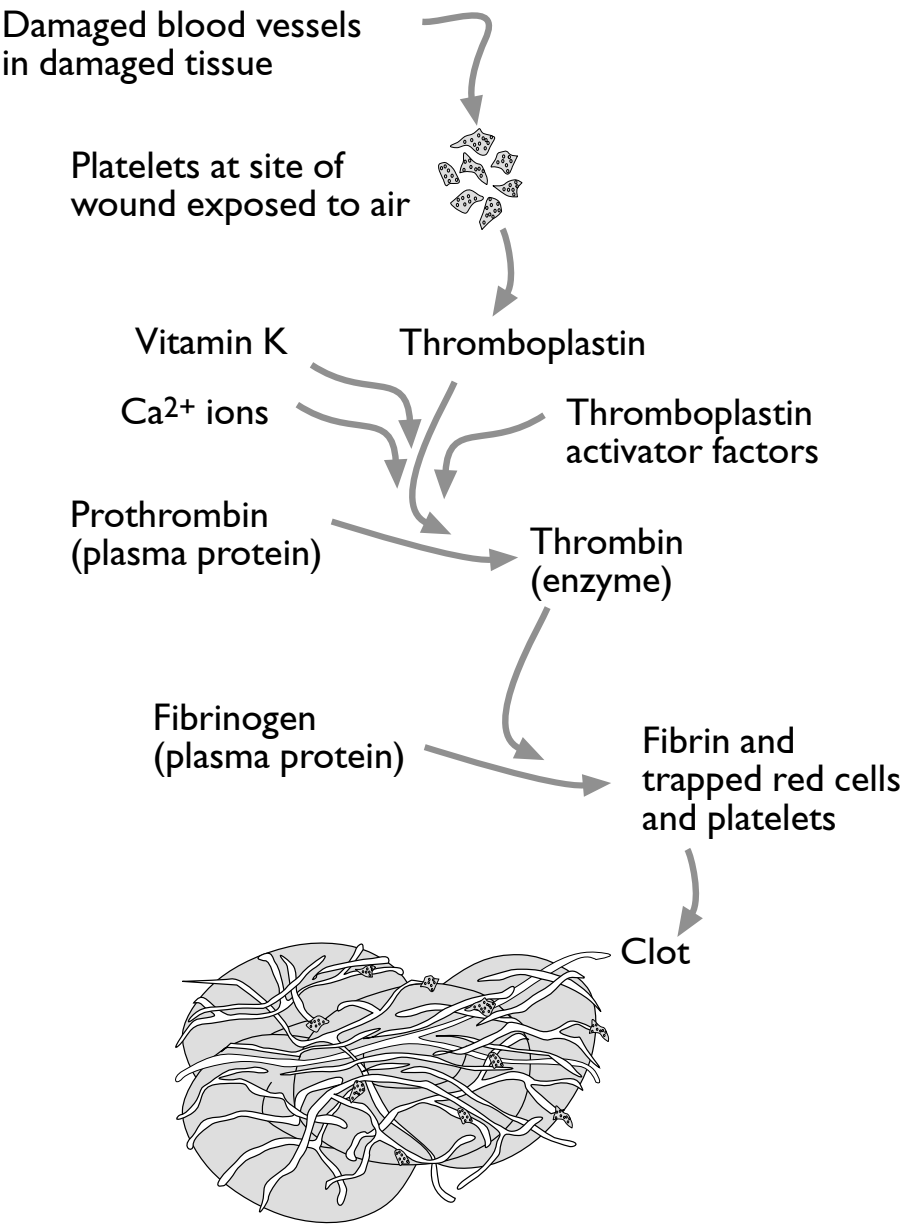
Bohr shift



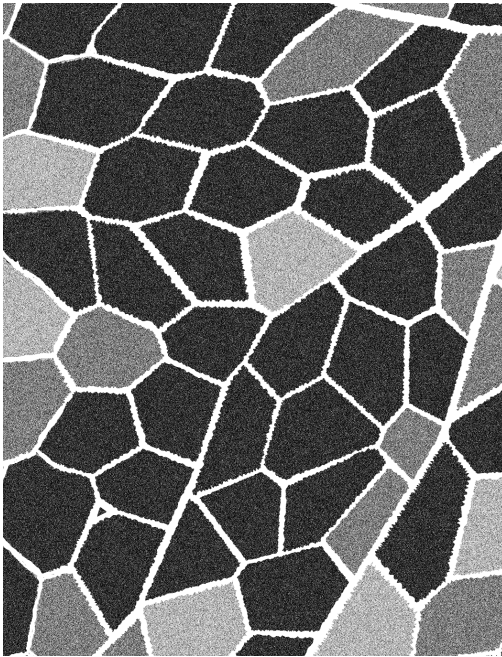
Fetal haemoglobin dissociation curve



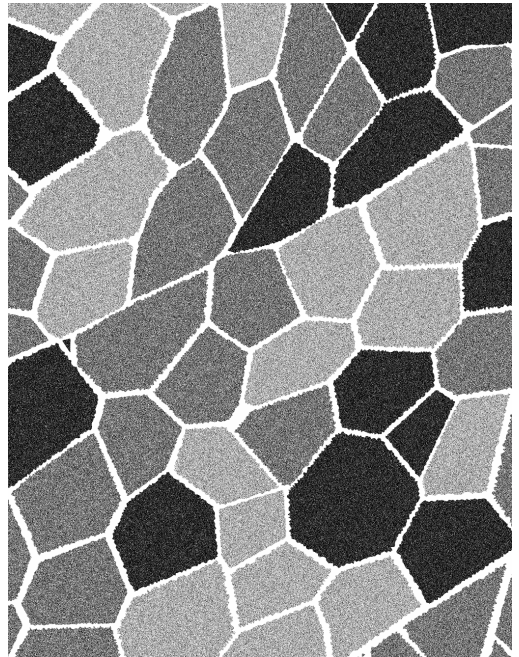
Blood clotting



Fast and slow twitch muscle fibres



Sprint Runner
70% Fast-twitch fibres (*light*)



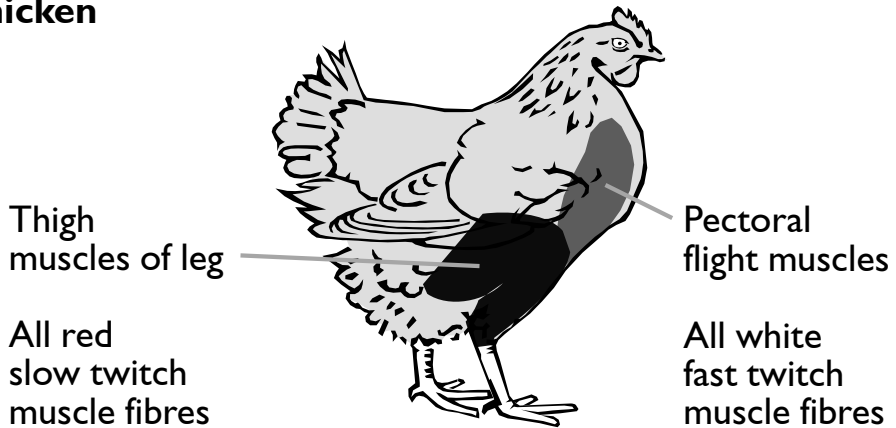
Marathon Runner
90% Slow twitch fibres (*dark*)

Skeletal Muscle Fibre Types and their Properties

Type	Colour	Contraction	Metabolism	Properties
I	Red	Slow-twitch	Oxidative (aerobic)	Fatigue resistant Low force/power
IIA	White	Fast-twitch	Oxidative/glycolytic (aerobic/anaerobic)	Intermediate
IIB	White	Fast-twitch	Glycolytic (anaerobic)	Fatigue susceptible High force/power

Chicken muscles

Chicken



Dark red chicken leg



White chicken breast

Oxygen deficit and oxygen debt

